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II. MEDIÆVAL MILITARY SURGERY

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IN the discussion of Ancient Military Surgery, it became obvious that the early military surgeons occupied an unenviable position in the armies of all countries. Many of them, besides practicing their healing art, were required to serve in the ranks as privates and as servants and ordinary barbers to their officers. Many of them lacked elementary education and had no idea of anatomy and the art of surgery. Most of them came from the lower walks of life imbued with a servile spirit and without originality of thought. They were poorly paid for their services, had no authority, and were looked down upon even by the privates. No wonder that the medical men who followed the armies at that time were not respected and that so little confidence was placed in their skill. Ancient military surgery was the same from beginning to end, a repetition of the practice founded by the then bright minds in medicine, Hippocrates, Celsus, Albucasis and Avicenna. The same clumsy instruments for the extraction of arrows and other foreign bodies were used for centuries and the formulæ for external applications in the form of salves, plasters, infusions, and decoctions to draw the foreign bodies to the surface increased in number to a confusing extent. Ignorance and superstition clogged the wheels of progress, and the respect for authority checked original thought and paralyzed all efforts to deviate from the well-trodden paths established by authorities who were regarded as infallible in their teachings and practice. The routine practice of the authors I have quoted remained unchallenged until the beginning of the mediæval period. Historians allude to the Middle Ages as the great period lying between the ancient and modern epochs of the world's civilization, and separate them from each other as young manhood separates youth from mature age. Different writers set different limits to the so-called mediæval period in the history of the world from the year 486 to 1648, A.D.

The mediæval period is also frequently referred to as the Dark Ages, a time when the world's progress, so to say, was at a standstill. When we look back to that period we will, however, find many brilliant lights flickering here and there, lighted by human genius and maintained by persevering toil in the line of original thought and research. This applies with special force to military surgery. The mediæval age of military surgery can be said to date back to the invention of gunpowder, and terminated with the invention of modern firearms, which was almost coeval with the dawn of modern surgery — antisepsis and asepsis. We will therefore discuss in this lecture more particularly gunshot wounds, inflicted by the old fireams and the large calibre leaden ball.

INVENTION OF GUNPOWDER

The question of priority of the invention of gunpowder had never been definitely decided. Some claim that it was known in China long before the mysterious Franciscan monk, called Schwarz, made known the composition of his discovery. The true name of this monk is said

to have been Konstantin Anklitzen. He received the name Berthold on entering a Franciscan monastery, either at Metz, Cologne or Gosslar, and was called Schwarz on account of his passion for the black arts. According to legend, he invented gunpowder in 1259 (the dates 1320 and 1354 are also given), and in Freiburg, Germany, his reported birthplace, a monument was erected in his memory in 1853. The world at large is indebted to this obscure monk for the invention of gunpowder and for the subsequent complete revolution in warfare by the substitution of firearms for the bow and arrow, crossbow and catapult. Dionis, a distinguished surgeon of the eighteenth century, credits the monks not only with the discovery of gunpowder, but also with the invention of the most murderous implements of war, and refers to them with terms by no means complimentary to their guild. (Cours d'Opérations de Chirurgie, Démontrées au Jardin Royal, 1777, p. 639, First Ed., 1740.)

"Depuis quelques siecles, il est sorti des enfers un monstre habille en Moine, qui travaillant à la Chemie, a trouvé une composition de salpetre et de souffre, q'on appelle de la poudre à canon. Cette invention diabolique a fait que l'homme a fabrique des armes à feu de toutes especes, et non content des pistolets, des fusils et des mousquets, qui ne tuent les hommes qu'un à un, il s'est avisé de forger des canons capables, d'en tuer dix ou douze à la fois, et de detruire et d'abuttre les remparts qu'il avoit élevés pour sa sûreté; et depuis dix ans, il a encore paru à la Cour un autre Moine, qui a cru qu'il ne suffisoit pas d'exterminer dix hommes avec un boulet de canon, mais qu'il falloit en tuer au moins trente; c'est pourquoi il est venu exprès pour en produire une nouvelle fabrique, composée de trois canons joints ensemble, qui chacun chargé d'un boulet, tirent en meme tems qu'on a nus le feu à leur lumiere commune."

If Dionis could return and visit our great arsenals and see the different kinds of smokeless powder and the still more terrible explosives, the repeating far-reaching rifles, the gatling guns, the giant engines of war, torpedoes and ironclad battleships bristling with cannons, he would use even more severe language in denouncing their inventors, and yet we have reason to believe that the science and art of killing men have not yet reached perfection, and we may confidently expect that still more destructive firearms, large and small, will be invented and used in the future.

ANCIENT FIREARMS

The introduction of firearms as weapons of war made a complete revolution in military strategy and changed entirely the aspects of the battlefield. It increased the distance between the fighting lines as the new projectiles had a longer killing range and the combatants, instead of looking into each other's determined faces, were confronted at a distance by the death-dealing

"Brazen throat of war."—Milton.

Firearms made war a science and an art. The noiseless projectiles of the old arms gave place to the rattle of musketry and the booming and thundering of cannons. The fire-spitting pieces and the clouds of black smoke located the enemy. The sharp voices of command, the shouts of the infuriated soldiers and the groans of the wounded and the moaning of the dying were deafened by the terrible voices of the new implements of destruction. This change in warfare opened up a new field for the surgeons — the treatment of gunshot wounds. The use of firearms in war dates back to the middle of the thirteenth century. It is not definitely known whether they were first used in China, Spain or Germany. It is known, however, that they came late in use in France and England. Merian (Weltgeschichte, bd. iii, s. 316) mentions the use of cannons by the English army at the siege of the city of Mainz, in 1426.

"Zwei Jahr hernach (1426) belägerten die Engelländer die Statt Mans, und brauchten damals die ersten Grobe Stück davor, die Mawren damit zu beschiessen. Dess erschracken die Bürger, dass sie sich ergaben."

It is very natural that firearms took the place of the old weapons only gradually, as their manufacture at that time was a very slow process. In the year 1385 there were among the Leipzig sharpshooters 39 crossbows and 16 guns. The Brandenburg troops who marched against Stettin in 1429 had four crossbows to one gun. During the thirty years' war many

of the soldiers were armed with halberds and lances. It was as late as 1680 when these weapons were abandoned, and in 1700 firearms were used exclusively. The bayonet made its appearance as early as 1640. In some of the pictures in old books on surgery are represented the mixed arms of armies of that time, consisting of bows and arrows, crossbows, halberds, lances, muskets and cannons. The first few hundred years after the invention of gunpowder the firearms underwent but few changes which could be called improvements. They were heavy and clumsy, and were only used in sieges. The original firearms, called bonbons, were clumsy, heavy, non-portable tubes of iron, and it was not until the early part of the fifteenth century that the lighter pieces were manufactured. Even these required for their transportation and service several men, and were fired in the field from a tripod and from fortress walls on a rest. These hand cannons were employed in large numbers by the Duke of Orleans as early as 1411, and from the note quoted from the historian, Merian, it appears that cannons were used by the English army in 1426. They could be carried by two men, had a straight stock of wood about three feet long, and were fired by a match applied on top of the breech.

The first change made was the removal of the vent to one side and the addition of a pun to hold the priming; a sight on the breech was also added. The trigger of the crossbow suggested to the English a similar arrangement for bringing the match in touch with the powder in the pun.

We have reason to believe that the match-lock gun was used in China long before it was invented in England. The stock was made curved, permitting aim to be taken from the shoulder instead of firing from the chest as formerly, and the weight was reduced to fifteen pounds. The former tripod was replaced by a forked rest which the soldier carried as a cane. The first material improvement of the small firearm was the substitution of the flint-lock for the match-lock. The time-consuming and uncertain match was replaced by some arrangement of flint and steel; this arm was adopted by France in 1671, an example followed by all other nations within twenty years. For 150 years the flint-lock musket became the universal arm among all civilized nations, until early in the nineteenth century the invention of the percussion cap, made of practical value about 1820, led to the gradual substitution in the next two decades of the percussion musket for the flint-lock. Up to this date military small arms were smooth-bores, and fired round balls between one and a half and nearly three-fourths of an inch in diameter. The primitive projectiles were of the rudest kind, made of stone, wood, lead, wrought and cast iron. The spherical pure leaden ball held its place in military service for several centuries; the conical bullets and bullets of lead, hardened by the addition of other metals, are of comparatively recent invention.

We will now consider

THE TREATMENT OF GUNSHOT WOUNDS INFLICTED BY THE PRIMITIVE FIREARMS

The literature on the treatment of wounds, inflicted by the ancient implements of warfare, as we have shown, is extremely meagre. The treatment was a routine one, consisting in attempts to remove foreign substances lodged in the body, if this could be done without much additional injury. The instruments employed were of the rudest kind, and for centuries no material improvements were made in their construction and efficiency. Superstitious faith in the power of drawing remedies in cases in which extraction failed or an operation was deemed inadvisable remained unshaken, and the materials employed in their preparations possessed few or no medicinal qualities and were often of a most harmful and disgusting kind. With such a state of military surgery the introduction of the destructive firearms brought new dangers and increased the suffering of the wounded. The ancient military surgeons seldom were called upon to treat fractures of the long bones, while the primitive firearms with their large projectiles frequently caused fracture of the limbs, with great tearing of the soft parts and extensive comminution of the bones, injuries very prone to grave forms of infection. We know little of the practice of surgeons in the treatment of gunshot wounds during the first century after the introduction of firearms. The surgeons did not seem to

Fig. 1. Treatment of poisoned wounds, Braunschweig, 1497.

realize the gravity of gunshot wounds as compared with arrow wounds or wounds inflicted by cutting implements. Thus Hans Gersdorf (Hans Gersdorf oder Schylhans. Feldtbuch der Wundt Artzney, etc., 1551), after giving an elaborate description of the treatment of arrow wounds, states that it would be useless for him to add a separate chapter on gunshot wounds as the treatment would be the same. He believed that the powder was a burning, irritating substance, and relied on warm hempseed oil in counteracting its harmful effects on the wound. Hempseed oil, so generally used by the German surgeons in the treatment of gunshot wounds, was introduced into practice by Nicolaus, a barber surgeon who enjoyed a great reputation, as he was the surgeon of Duke Sigismund of Austria, and attended him in three great battles. Gersdorf poured the oil into the wound and insisted that it should be used two or three times in succession by pouring it out and then refilling the wound again. After this has been done he substitutes for the oil an infusion of the inner bark of the linden and elder blossoms and later applied drawing plasters. The Egyptian ointment was made of honey, one pound; vinegar, half a pound; sulphate of copper and alum, of each half an ounce. This ointment enjoyed a great reputation for a long time in the healing of all kinds of wounds, but more especially of gunshot wounds. He made use of a long probe in searching for bullets lodged in the body

and employed a fenestrated forceps in attempting their extraction. If necessary, the wound of entrance was enlarged by dilatation with the loncher or with scissors. The wound was kept open by the use of a tent steeped in hempseed oil. Amputation was only performed if a limb was shot off, when the bone was sawed off even with the flesh, and a compress of tow saturated with hempseed oil applied over the wound. He recommends in a tone of the utmost confidence an ointment made of different roots and herbs, and the fat of hare, applied over a wound in which a piece of iron is lodged and cannot be removed, and claims that it is sure to bring the foreign substance to the surface. Several other formulæ are given for which similar miraculous curative virtues are claimed.

One of the very first publications on gunshot wounds was by Alphonsus Ferrius, published in 1539 (De Sclopetorum sive Archibuscrum vulneribus. Lib. iii.) The same author invented a new instrument for the extraction of bullets.

Among the oldest writers on gunshot wounds were Capri, Pfohlsprundt, Maggius, Braunschweig, and Marco Cumano.

Pfohlsprundt wrote on this subject in 1460. The publications of the surgeons of the fifteenth, sixteenth and seventeenth centuries follow no uniform course in the description of the treatment of gunshot wounds. While some who considered such wounds as poisoned wounds treated them with boiling oil, multiple scarifications, cupping and venesection, others objected to these barbaric methods, and among these were principally the German surgeons, who resorted to mild measures, such as warm oil of turpentine and hempseed oil and warm milk.

Braunschweig (Dies ist das buch der Cirurgia. Handwirkung der Wundartzny von Hyeroimo Bruschwig, 1497.) regarded gunpowder as a poison and emphasizes the necessity of neutralizing its destructive effects by pouring into the wound warm violet oil. He also mentions frequently camphor and oil of turpentine as local applications, and if these drugs cannot be obtained, cow's milk or what he considers more effective, goat's milk. He recommends keeping the wounds open by the use of tents rubbed with pork. He speaks of the fenestrated forceps in connection with extraction of bullets. In gunshot wounds of the limbs, if the bullet has passed through, he inserted a seton and by seesaw motions aimed to remove the powder.

"Item do einer Geschosse ist mit einer buchsen unnd der Klotz her uss ist unnd von dem pulver vergifft oder etwas des pulvers noch dar in beliben ist. In einem arm, bein, od' wo es ist das der Klotz durch Gange ist. So nim ein herin seil und Stosse das durch den Schuss, und Zühe est hin und her uff alle ort so machest du das pulver uss der wunden."

A famous Swiss barber surgeon by the name of Felix Würz ("Wund Artzney," Foelix Würtzen. Weiland des Berühonten Wund Artz zue Basel. Strassburg, 1670. First Ed., 1563.) fought the use of opium as a local remedy in the treatment of gunshot wounds, and the theory that gunpowder poisons or burns wounds. "Solches Gummi ist in Keiner wunden nulzlich: Dann es Kuhlet Keine Wunde ausserlich, sondern brennt in den Wunden und Schäden, als solches die Erfahrung selber bezeuget: Darumb es dann Keinen Brand vom Büchsen pulver löschen Kan. Diess Löschet einen Brand, was Feuer an sich zeucht: Als da ist der Salpeter unnd nach diesem der Schwefel. Es ist jeder Natur Gemäss, dass der Salpeter und Schwefel ihr Feuer wieder an sich Ziehen, so sie verlohren haben: und hier mit das selber wiederumb löschen, was sie haben angezünd."

Würz was opposed to the removal of blood from the wound, as he claimed that the blood protects the wound against the entrance of air and favored the spontaneous arrest of hemorrhage and aided in establishing supuration, which, according to the then prevailing idea, always must precede the healing process. He protested against the use of camphor as a local remedy, as he regarded this substance as a heating and not as a cooling remedy. As hemostatics he relied on crocus martis, alum, white hair of the rabbit, dried blood and compressed agavicus. He strongly objected to the use of the actual cautery and burning cotton. He did not approve of the use of tents, as he insisted they would tend to provoke secondary hemorrhage, and would aggravate the pain. He taught that nature should be assisted in the

Fig. 2. Amputation of the leg. Gersdorf, 1551.

elimination of pus and foreign substances from the wound. He raised his strong voice against the use of salves and dirty oils, as these things were prone to aggravate the existing inflammation. In place of the different kinds of oils, then so generally in use, he gave preference to honey as a local application. He was in favor of making an effort to remove bullets lodged in the body, and in cases in which the bullet had passed through a limb inserted a thin seton, moistened with gum tragacanth, so it could be easily inserted and moved to and fro. Internally, he used nitrate of potassa drinks to control the inflammatory fever, and recommended at the same time large draughts of boiled water. After the subsidence of the inflammation he frequently resorted to venesection, which he considered harmful during the height of the inflammatory process. Like Paracelsus, he had great faith in the remedial virtue of the fresh juice of crabs as an ingredient of cooling salves, combined with honey. Würz was far ahead of his contemporaries in the treatment of gunshot wounds and his teachings and practice show an originality of thought — one of the few flickering lights in surgery during the middle ages. His treatment of hemorrhage was far in advance of that of Gersdorf, who tamponed bleeding wounds with flaming cotton, and if this failed, applied the droppings of peacocks, which he regarded in the light of a powerful styptic, and as a last resort depended on a mixture of pitch, cypress nuts, seeds of pomegranate and unslacked lime made into a paste with the albumin of egg, and applied on tow.

One of the first special works on military surgery was written by Mithobius (Consilium oder Rathschlag vor die Schreckliche Krieger Krankheit heftiges Fieber, Hautwehe und Brennen, vor arme Leutlin auff des hochgeborenen Herrn Georgen Ernsten, Fürsten zu Henneberg, etc., Gnediges begern. Erfurt, 1553). Then followed in rapid succession the works of Cober, Fonsca, Rhomelius, etc.

Superstition prevailed to a frightful extent and blinded the minds of the brightest men in the profession. Human fat and the fat of different animals, including that of the rain worm, was looked upon as a potent healing remedy, and formed an ingredient of many of the much-vaunted healing salves. Urine and dejecta from different animals had their advocates, and often among men who were at the head of their professions. Charlatanism was rampant in those days. Secret remedies were extolled and the "no cure, no pay" methods were much in vogue. Purmann raised his voice against secret remedies and deceptive practices when he said: "Rechtschaffene Wundärtzte, die ihren Nechsten mit schrifften dienen wollen, hinterhalten Nichts, sondern offenbaren es."

Purmann was an honest surgeon and his book on military surgery (Matthäi Gottfried Purmann, Feldscherer, 1738) is by far the best one of the mediæval age. It is replete with excellent ideas on the nature and treatment of gunshot wounds. He described these wounds as contused, lacerated injuries, and as being

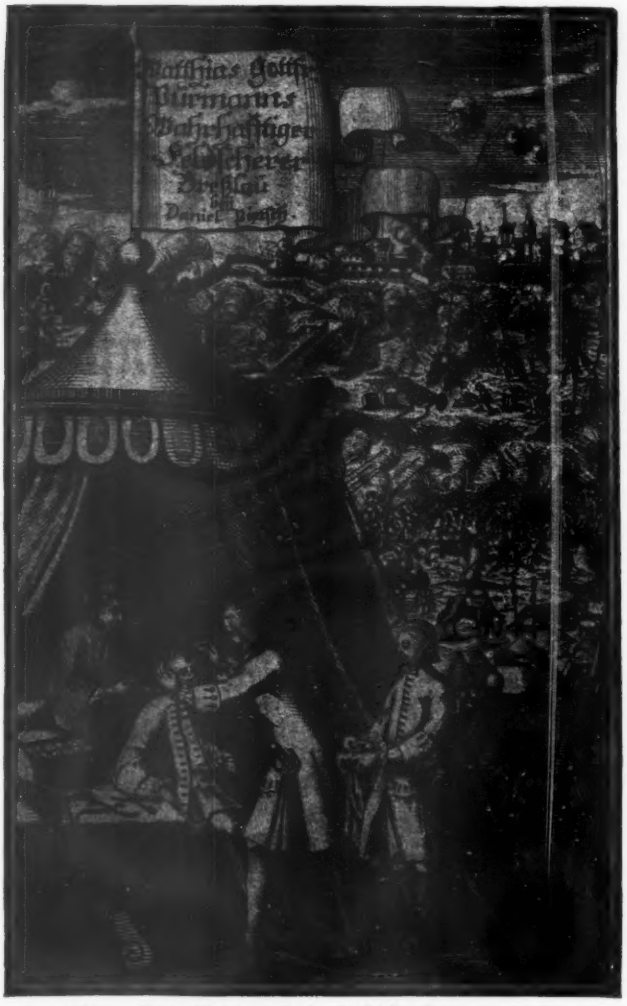

Fig. 3. First-aid tent on the battle-field. Purmann, 1738.

of a much more dangerous character than incised and stab wounds, as they give rise to more serious complications. Among the fire-arms of that time he mentioned tubes (bonbons), muskets, pistols, Terzerol. He condemns the use of hot oil and directs his local and general treatment toward the prevention of mortification. If the bullet is imbedded in the tissues, his advice was to remove it, if possible, as well as other foreign bodies lodged in the wound, including splinters of bone.

In gunshot fractures he cautioned not to resort to the use of splints too soon. He invariably maintained drainage of the wound by the insertion of a tent. He had great faith in injecting wounds with his favorite lotion, which contained as the most important ingredients vitriol, acetate of lead and the fresh juice of crabs. He mentions as his most reliable authority Leonhardus Botallus, who wrote a monograph on the treatment of gunshot wounds. Purmann was the first one to de-

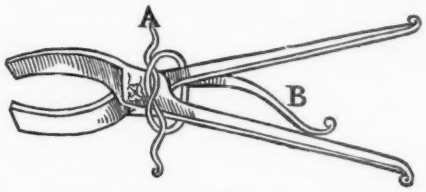

Fig. 4. Artery forceps for applying ligature. Hilden, 1615.

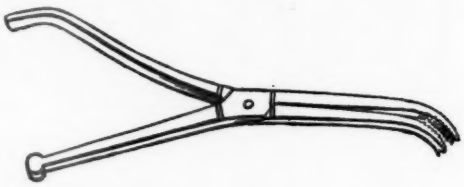

Fig. 5. Paré's artery forceps.

scribe deformation of bullets, a subject which was later studied experimentally by Le Dran and Bilguer, who described the conditions under which it occurs. The round bullets, fired from the smooth-bore guns, owing to their feeble penetrating power, were not much deformed, and often lodged in the body and became more frequently encysted than later. The book of Gelman (Chirurgiae Tripartita Flora, das ist Dreyfache Chirurgische Blumen, etc. Georg Gelman. Des Fürstenthumbs Bamberg bestellter und Gewesener Augen, Schnitt, Leib und Wund-Artzt, 1652.) is of interest in connection with our subject in reference to what he says concerning gunshot wounds of the heart and tetanus. He states that these wounds are uniformly fatal and describes well the symptoms which precede death. Then he comments: "Die Zufälle sind schnell aufeinander biss der schnelle Todt folgt, Gott gebe dass bey manchen der Tod Seelig möcht sein, welcher aus Verletzung der Waffen so Schnell dahin führet. Der Handgriff bey diesem Schaden ist, dass man den todten Cörper öffne und die Verletzung besehe, an welchem Ort das Hertz verwundet. Die Artzney sind Schauffel und Hawen sampt der erden, darinnen die verwesung Geschehen muss."

In a case of gunshot wound followed by tetanus and death he blames the surgeon for the unfortunate termination, and says that the patient could have been saved if he had been given a draught of Thiriak Andromach in wine of the lilly of the valley, as a diaphoretic, and if the neck and back had been thoroughly rubbed with the ungt. melilot, and the mouth had been kept open with a gag. The best mirror of a beginning of the rational treatment of gunshot wounds of the mediæval age is the work of Hilden, a Swiss barber surgeon. (New Feldt Artzney Buch, etc. Guilhelmum Fabricium Hildanum, 1615.) The book was intended as a guide for the surgeons in the field. At the time this book was written the question of the burning, poisonous action of powder in the wound was undergoing a heated discussion. Hilden stated that he could furnish positive proof that the bullet is not heated by the explosion of the powder, and that the articles of which powder is composed, nitrate of potassa, sulphur and carbon, are all harmless substances, which can be taken internally without any ill-effects. The intense inflammation following gunshot wounds he attributed to the laceration of the tissues caused by the bullet, and to the mal-treatment of the wound by ignorant surgeons. Let us listen to some of his most important teachings. The first thing to be done in the treatment of gunshot wounds is to induce speedy and profuse suppuration, in order to hasten the elimination of the contused lacerated tissues without which the wound cannot heal, as has been taught by Hippocrates and experience. In gunshot fractures remove bullet and splinters, reduce and treat the fracture, like a simple fracture. If foreign substances cannot be removed at once, repeat the attempt the next and third day, but at no subsequent time. In such cases suppuration must be favored for the purpose of speeding the spontaneous elimination of all foreign substances. In one of the several cataplasms which he recommends for this purpose he incorporates human fat and oil of rain worms. If the bullet has passed through a limb he inserts in the track a cord of silk anointed with one of his many salves. The cord is to be removed daily and replaced by another one which is drawn through the wound by tying them together. When suppuration is under control the cord is removed, a tent inserted into

each end of the track. He warns against the use of tents as long as suppuration is going on, as they interfere with drainage and escape of foreign substances, such as hair, fragments of clothing and paper. Honey, aloes, theriac and myrrh appear often as component parts of the complicated prescriptions for salves. The blind faith in the drawing power of these salves remains. Gentian root and sponge are highly recommended as materials for tents. Spare diet and no stimulants for the first ten days. Venesection and cathartics are indicated in plethoric patients. In injuries of the head introduce a seton at the back of the neck, which draws the harmful humors away from the wound. Healthy limbs should be firmly bandaged to drive the humors to artificial outlets. Like Dionis, he regards firearms as inventions of the devil, and all new improvements have a similar source. He was under the impression that some of the bullets are poisoned, as sometimes very slight injuries result disastrously, while some of the gravest injuries inflicted by clean bullets heal promptly. Poisoned wounds require local and general treatment. Internal remedies to strengthen the heart and eliminate poison. Diaphoretics are employed for the same purpose. Venesection and purging in such critical cases only by direction and under the supervision of a competent physician. Wet cupping around the wound should be repeatedly practiced during the first three days with a view of removing the poison. From above it will be seen that Hilden had some new and excellent ideas on the treatment of gunshot wounds, but his brilliant mind remained tainted with the superstitious notions of his time. Hilden was a remarkable man. He was born in the village of Hilden, Switzerland, 1560. His treatise on Gangrene appeared in twelve editions during his lifetime, and was translated into several languages. His

Fig. 6. Amputating saw. Hilden, 1615.

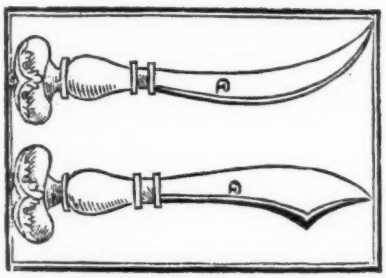

Fig. 7. Amputating knives. Hilden, 1615.

fame as a surgeon extended far beyond the limits of his country. He finally became ambassador to the Court of France, and was appointed body physician and surgeon to the King of France. He died at Berne, 1634.

The greatest advance in surgery during the mediæval age was made by Ambroise Paré, a French military surgeon of the sixteenth century, by the substitution of the ligature for the actual cautery and the many harmful styptics until then relied upon in the treatment of hemorrhage. Paré was not the first one to use the ligature, but to him belongs the great credit of having led the way to its general introduction in the practice of surgery. He followed the French army during many long and hard campaigns. It was on the battlefield he put his idea first in practice. He made use of the indirect ligature, including in the grasp of the needle some of the soft tissues around the bleeding vessel. Paré's teachings and practice concerning the ligature met with violent opposition from weighty quarters, and it took a long time before the ligature was universally recognized as the safest and most reliable hemostatic. Gersdorf first secured the end of the bleeding vessel with needle and ligature, and then cauterized the stump with the actual cautery, and relied on the ligature only in exceptional cases. "Nem die Nadel und Stich under die Ader, und Zeuch sie dann härdurch, und Knupffe denn die Ader zu, so steht es."

If several vessels were bleeding, he filled the wound with cotton, ignited it with the actual cautery, as he considered this method much less painful than the diffuse application of the red hot iron directly to the tissues. Heister replaced the indirect by the direct ligature.

Fig. 8. Ambroise Paré, from Malagigne, Œuvres Complètes d'Ambroise Paré.

But Paré did more than to generalize the use of the ligature. He taught that in searching for bullets the injured part should be placed exactly in the same position it occupied the moment the injury was received, hence the famous case of General Garibaldi, which attracted so much attention at the time, was nothing new in military surgery. He also gave a good clinical description of pyemia in 1562. He placed great importance in searching for and removing the bullet, and loose splinters of bone, as quickly as possible, in preference on the field. Ambroise Paré was not only a great surgeon; he was also a humanitarian of the first order. He had the health and welfare of his soldiers at heart. He was untiring in his efforts to aid the wounded and the sick, often at the risk of great danger to his life and health. He finished his great book in the French language February 8, 1579. It was translated into Latin by Jac. Guillemeau, and a German translation appeared from the press of Johann Feyerabend, Frankfort, 1593. The complete works of Paré were edited by Malgaigne in 1840. (Œuvers Completes d'Ambroise Paré, 1840.) The uncertainty of the fate of the wounded of Paré's time is best indicated by one of his utterances so frequently quoted and engraved on his statue: "Je le panse et Dieu la guerit." Paré enjoyed the confidence of his commanders and the love and respect of his soldiers. His eminent services as a military surgeon made him a favorite at the court as he was the surgeon of several of the French kings. He died full of honors, beloved and revered by all of his countrymen, in 1585, after having practiced his profession for more than forty years.

THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE

(A) Its Basis, (B) Analysis of 500 Cases Treated Operatively,[1] (C) Conclusions

By AIMÉ PAUL HEINECK, M. D., Chicago, Ill.

SO as to convey a definite conception of what we understand and of what we mean by the term "Exophthalmic Goitre," at the outset we will quote two definitions, one from a popular Text-Book of Practical Medicine, the other from an equally authoritative Text-Book of Practical Surgery.

(*a*) Exophthalmic goitre is an affection, the chief symptoms of which are goitre, exophthalmos, tachycardia and tremor. In pronounced cases, other symptoms, chiefly of a nervous nature are present. (1).

(*b*) Exophthalmic goitre is a disease characterized by an enlargement of the thyroid gland, palpitation and increased frequency of the heart's action, by proptosis, fine tremor and general nervousness. (2). By goitre we understand an enlargement of the thyroid gland, which may be symmetrical, involving the entire structure, or which may be partial, as nodules and cysts. Murray (3) noticed an enlargement of the thyroid body in 172 out of 180 cases. In five of the remaining cases, there had been a goitre at an earlier stage of the disease. Kocher (Berne, Switzerland) says that he has never seen a well developed case without a goitre. Mayo (Rochester, Minn.) says that in those cases in which there is an apparent absence of goitre, a careful examination will usually disclose a small unilateral or bilateral tumor, which lies deeper, but is firmer than normal thyroid tissue. It is not the mere size of the gland which is of importance, but its structural alterations. The enlargement of the gland, according to the same author, is generally uniform. This is contradicted by equally good observers, and is contrary to my observations. It is important to remember that any individual symptom of exophthalmic goitre may be inconspicuous, or may be absent during a part or the entire course of any individual case of the disease. Thomson (4) describes severe and fatal cases in which both goitre and exophthalmia have been absent. It is further to be remembered that the symptoms do not appear in any regular order. We must also bear in mind that these symptoms vary in relative degree in different cases.

By tachycardia, we wish to denote a disturbance in the action of the heart, which is expressed in increased frequency. Tachycardia, not of a paroxysmal or of a transitory nature, but of a permanent character, is the most constant symptom of this affection.

There are primary and secondary forms of this affection. From an etiological, pathological and therapeutical standpoint, the classification into primary and secondary forms is consistent and valuable. In the primary form, there is a concurrent development of the goitre and of some of the other symptoms characteristic of this affection. In the secondary cases, the symptom-complex of this affection is grafted upon a pre-existing enlargement of the thyroid body. All varieties of goitre, irrespective of size, type, or state, from simple cysts to malignant tumors, may be associated with the symptom-complex of exophthalmic goitre; and it is further to be noted that in all of the secondary forms, excepting those associated with malignant disease, the prognosis of surgical intervention is better, both as to recovery from the operation, and as to recovery from the disease. (Dean Lewis) (5).

Authors are not in accord either as to the etiology or as to the primary pathological cause of exophthalmic goitre; therefore, the treatment most appropriate for this affection is still a matter of discussion. Owing to the fact that the ultimate cause of this affection is still a matter of *speculation*, theories have been advanced, and have been made and are used as foundations for apparently appropriate lines of treatment. Many of these theories have been abandoned. They were based on insufficient knowledge, on misinterpreted clinical and pathological data.

We will discuss briefly some of the theories which still have advocates:

[1] All the cases that could be found in the literature.

(*a*) The cardiac theory,
(*b*) The compression theory,
(*c*) The sympathetic theory,
(*d*) The nervous theory,
(*e*) The parathyroid theory,
(*f*) The thymus theory,
(*g*) The thyroid theory,

and then adopt as a working basis that theory which is least in conflict with facts.

THE CARDIAC THEORY

Tachycardia, palpitation, thrills and murmurs in the cardiac region, displacement and diffusiveness of the apex beat; increased area of cardiac dulness, due to dilatation or hypertrophy, and other symptoms of a cardiac nature, led many of the early observers, such as Parry, Stokes, Graves, Luton, and Beau, to think that the cause of this affection originates or resides in the heart. The cardiac theory is defective, because:

1. Those cardiac disturbances that occur in exophthalmic goitre can, and frequently do, occur independently of this disease, viz., toxic palpitation and essential tachycardia.

2. They can occur as symptoms in conditions totally distinct from exophthalmic goitre.

3. Cases of exophthalmic goitre occur in which they are absent.

4. The cardiac disturbances met in this affection are not exciting factors. They are due to co-existing or to complicating functional or organic diseases of the musculature, or of the various valves of the heart. We must not forget that long-continued, excessive, rapid action of the heart may beget organic changes in this organ.

5. In by far the largest number of cases of exophthalmic goitre that have come to the autopsy table, an absence of cardiac lesions has been noted. In some cases moderate hypertrophy with or without ventricular dilatation and endocardial disease was present. The dilatation of the heart has been ascribed to its quick action; the systole is too short to be complete, residual blood gradually entails overdistension and dilatation. This disease can occur in individuals with pathologic hearts, and then to the symptoms of the original lesion will be superadded the cardiac manifestations of the affection we are now discussing.

6. The cure of the exophthalmic goitre does not cure any of the co-existing organic cardiac lesions. Kocher reports two cases of exophthalmic goitre co-existing with mitral insufficiency. The symptoms of exophthalmic goitre were cured by partial thyroidectomy. The symptoms of mitral insufficiency were uninfluenced and persisted. This shows the non-interdependence of the two conditions.

THE COMPRESSION THEORY

When Tillaux performed his first thyroidectomy for the relief of exophthalmic goitre, he believed that the affection was caused by the compression exerted by the hypertrophied thyroid gland on the important vascular and nervous structures at the base of the neck. His patient recovered from the operation and from the disease, but the explanation which he advanced was erroneous. He later abandoned the compression theory. It has had many and still has a few eminent advocates. It is untenable, because:

It is hard to understand (A) how unilateral (6) compression (the thyroid enlargement may be unilateral, though it is more frequently bilateral) can cause bilateral exophthalmos.

(B) How unilateral enlargement of the thyroid gland can cause unilateral exophthalmos of the opposite side of the body, as in the cases reported by Panas and by Gros, etc. (6).

(C) How a unilateral exophthalmos can be dependent upon a bilateral enlargement of the thyroid body. How a bilateral exophthalmos can become unilateral without an associated diminution in the size of the thyroid body. And again, if compression be the cause, why the symptoms bear no relation to the degree of thyroid enlargement, for it is an acknowledged fact that in some cases of great severity, it takes the most precise and painstaking palpation to detect any enlargement of the thyroid gland. Easily detectable enlargement of the thyroid gland, like every other cardinal symptom of this affection, may be absent in individual cases. As a rule, the enlargement of the thyroid is not very great in this disease. The severity of the toxemia in Grave's disease seems to bear no relation to the degree of thyroid hypertrophy.

(D) Why, if the enlarged thyroid gland compressed any of the neighboring nerves, why

the recurrent laryngeal nerves, which by virtue of their anatomical location would be the ones involved most frequently, are so uncommonly in this affection the seat of compression paralysis? They are involved far less frequently than in cases of simple goitre. There are, at the most, only ten cases of exophthalmic goitre, in which paralysis of one or of both recurrent laryngeal nerves has been observed and reported.

(E) Why do not massive tumors of the base of the neck determine exophthalmic symptoms? Why, large parenchymatous or cystic goitres can exist for years and never be productive of, or be associated with, the symptom-complex of this disease? If compression were a determining factor of this disease, its action would be invariable. Under like conditions it would produce like results.

(F) If the symptoms were due to pressure, they would disappear immediately and completely on the removal of the compressing agent. We know that they do not thus disappear.

THE SYMPATHETIC THEORY

This theory was advanced by Kobens, defended by Trousseau, Oppenheimer and others. Only a few clinicians now advocate it. Disturbances of the sympathetic system with or without structural change can explain some of the symptoms of this disease. They fail to explain many. Observers of note, such as Abadie, Jaboulay, Poncet, Jonnesco, etc., have looked upon the cervical sympathetic trunk and its ganglia as the primary seat of the disease, as the fons et origo mali. In the primary forms of the affection, some have advised, and the last three individuals mentioned have devised and performed operations upon the sympathetic nerves for the relief of primary exophthalmic goitre. Jaboulay, in some cases of primary exophthalmic goitre, performs a bilateral division of both cervical sympathetic nerve-trunks. In other cases of the primary form of this disease, he perfoms a bilateral resection of both nerve-trunks. Jonnesco, in the primary forms of this affection, performs a complete resection of both cervical sympathetic trunks, including the upper, the middle and the lower cervical ganglia. The value of these operative procedures has been much contested. The uniformly good results obtained by their originators have not been obtained, nor even been approached, by other equally dextrous and competent operators. Operations on the sympathetic for the relief of the primary forms of exophthalmic goitre have fallen almost into complete disuse, not on account of any difficulty of execution, but because of their therapeutic inefficacy. They have never been advised for the secondary forms of the affection.

Schiff in his experiments noted that no effects on the thyroid gland followed the section of the sympathetic cervical nerves.

So many observers have examined the cervical ganglia in this disease that it is quite impossible to refer to them all. In a certain number of cases, lesions of the sympathetic nerve have been reported. The changes were such as are often found in many other diseases, such as are often found in health. Abadie, one of the most ardent advocates of the sympathetic theory, says: "The nervous sympathetic trunk is neither diseased nor degenerated; its tissue is intact and does not show any lesion." However, he gives no detailed report of observations. Hale White (9) has shown by a careful series of investigations on patients dying from other causes, that variations in the size and in the vascularity of the cervical sympathetic ganglia, as observed by the naked eye, have no significance; that the cellular elements are found in such various degrees of number and integrity, and that the fibrous stroma is so variable as to prevent any definite statement. He further says: "This evidence (his observations and those of others) seems to me conclusively to show that the lesion is not in the sympathetic nerves."

The only recent observer that has found positive changes in the sympathetic cervical ganglia is Greenfield (10). The changes which he noted are not characteristic. In two cases examined, he found these ganglia to be swollen, markedly hyperemic and infiltrated with leucocytes. Degenerative changes in the ganglion cells were present. Ehrich (11) is of the opinion that what degenerative changes have been found in the sympathetic nerve are purely secondary. The only changes which he found were vacuolation and fat droplets. In Temoin's case (12) microscopical examination of the

sympathetic cervical ganglion showed nothing definite. Numerous observers of great competence and acuity of observation report negative findings. Achard and Joffroy examined the cervical sympathetic ganglions in four cases of exophthalmic goitre and found them absolutely normal. Ranvier examined one case; his findings were the same. The observations of Marie and Marinesco, of Mendel, of Joffroy and Achard taken in connection with those of Wilks, of Barth and of Dejerine, suffice to convince one that exophthalmic goitre is not due to organic disease of the sympathetic nervous system.

If we assume that this disease is dependent on a functional involvement of the cervical sympathetic trunk and its ganglia, we could not satisfactorily explain why in the same nerve-trunk there is a stimulation of some fibres, depression of others and functional integrity of the remaining fibres. Dilatation of the pupil, which is perhaps the most constant symptom of stimulation of the cervical sympathetic nerve, is notably absent in Grave's disease. The fact that there are no invariable ocular or pupillary symptoms or signs, further argues against the primary involvement of the sympathetic as being the cause.

THE NERVOUS THEORY

This is supported by Sattler, Putnam, Mendel, etc. Owing to its apparent sudden onset, to its frequent occurrence in individuals of the same families, be they ascendants, descendants or collaterals; owing to its far more frequent occurrence in women, and to the fact that the sufferers of this affection frequently belong to neuropathic families in which cases of epilepsy, hysteria, chorea, or even some form of nsanity have occurred; owing to its frequent-association with nervous affections of a func, tional or organic nature, such as hysteriai neurasthenia, tabes dorsalis, syringomyelia, epilepsy, etc., and also to the many nervous manifestations of this disease, such as tremor, general nervousness, mental disturbances, paresis and paralysis, etc., (these patients are almost invariably nervous, capricious, hysterical and poor sleepers), many clinicians have been led to believe that this affection is dependent upon either a functional or an organic disease of the cerebro-spinal nervous system. If we consider this affection a neurosis, that is, a nervous disease having no demonstrated organic basis, we will have to classify it among such functional nervous diseases as hysteria, chorea, neurasthenia, etc. We cannot so consider it, as we know that this disease is always associated with definite histo-anatomical changes in an organ not belonging to the nervous system. As to its being a nervous disease with appreciable anatomical lesions in the nervous system, we now will submit the evidence for and against this contention.

Edmunds, W. (13), and other investigators have found that the nerve lesions of exophthalmic goitre are extremely uncertain. One observer has found one change; one, another. And when, in the case of Grave's disease, a systematic examination of the nervous system has been made, the findings have usually been negative. The lesions that have been found vary considerably in the different cases, though each one may be definite enough in itself. The lesions are inconstant, are not characteristic. We acknowledge that many of the symptoms clearly show that the normal functions of the nervous system are deranged, but similar disturbances occur in other toxemic states, and in the absence of constant organic changes in some part of their nervous system, they cannot be adduced as evidence of a nervous cause of the disease. No constant change in the peripheral nervous system has been noted. Mueller and several other observers have occasionally found changes in the pneumogastric and recurrent nerves; a few degenerate fibres being present in these nerves. As a rule, however, these nerves have been found normal. Mueller decided that the degenerative changes in the vagus nerve were secondary. Sir Victor Horsley noted in his experiments that the division of the recurrent laryngeal nerves was without effect upon the thyroid gland.

In those cases where the disease has coexisted with an organic disease of the spinal cord, such as tabes dorsalis, at the post-mortem table, there will be found the anatomical changes characteristic of that organic disease. In cases of exophthalmic goitre not complicated by an organic spinal cord disease, there is noted a total absence of demonstrable anatom-

ical changes. Greenfield believes that he noted in some cases that came to autopsy, changes similar in nature, but less marked in degree, to those which are noted in tetanus and hydrophobia. Most observers, however, have noted no change other than slight degrees of congestion, and even this slight degree of congestion was present in only a few instances.

As to the brain, Eger noted in one case adhesions of the dura mater over the convexity. Peter, in another case, found a large hemorrhagic focus in the pons and medulla. Vandervelder and Le Boeuf report having found a vascular neuro-sarcoma beneath the gray matter of the left superior parietal convolution. We must bear in mind that these findings are isolated findings; they are exceptional occurrences; they are coincidences. In almost all of the cases that have come to the autopsy table, the brain and its membranes were not the seat of changes detectable with our present methods of examination.

Filehne, in experimenting on rabbits, found that when he transected the restiform bodies at different levels, that he was able to produce tachycardia, exophthalmos, and occasionally the autopsies showed swelling of the thyroid gland. Bienfait partially confirmed these results in 37 per cent of his cases.

Tedeschi, as a result of experiments personally conducted, came to the following conclusions:

1. That injury to the restiform bodies in rabbits artificially produces exopthalmic goitre.

2. In animals thus affected, when the symptoms have disappeared, they can be reawakened in part by hyperthyroidication.

3. In animals in whom the thyroid body has been removed, lesions of the restiform bodies do not produce exophthalmic goitre.

4. In animals in whom the exophthalmic goitre symptom-complex has been produced by loss of the restiform bodies, removal of the thyroid gland diminishes or completely banishes the greater part of the symptom. These experiments prove the intimate relation existing between the secretion of the thyroid body and this disease, and show that the partial thyroidectomy has a beneficial influence upon the experimentally produced disease.

The objections to considering atrophy or degenerative changes in the restiform body as being the cause of the disease under discussion are many. Atrophy of the restiform bodies has been found in cases of tabes dorsalis, in which symptoms of exophthalmic goitre were not present. (Oppenheim) (2). Lesions of the restiform bodies would not explain the partial paraplegia, would not explain the muscular atrophy, the absent or diminished patellar reflex, etc. Joffroy (3) and Achard (14) were unable in their experiments on animals to reproduce the symptoms of Grave's disease by provoking injuries of the bulb. "That lesions of the restiform bodies are quite exceptional is evidenced by the fact that in 16 cases reported by recent observers (Joffroy, Siemerling, Koeppen, Goldscheider, Mueller, Achard), the restiform bodies are described as absolutely normal." (Francis P. Kinnicult) (2).

We see by all that precedes that exophthalmic goitre is not due to a constant and characteristic nervous lesion, demonstrable in every case. Post-mortem observations teach us that in most cases of this disease there is a total absence of anatomical lesions of the cerebrospinal and sympathetic nervous systems, that is, of such lesions as can be revealed by our present methods of examination.

THE PARATHYROID THEORY

Not much is known concerning these bodies. A great deal of speculation concerning their functions, and also concerning the results of pathological changes in them, has been indulged in. They are four in number, two on each side. They contain no follicles, no colloid substance and are composed of epithelial cells. It has been suggested by some (Edmunds, MacCallum) that exophthalmic goitre might be dependent upon the absence of the glandulae parathyroidae, or upon functional or structural disturbances present in one or more of them. We cannot, for the time being, adopt this theory as a working basis, because:

1. Our knowledge concerning the physiology and pathology of these glands is as yet limited.

2. Parathyroid therapy is useless in this affection. Walsh (15) came to the conclusion that there are no grounds for the idea that insufficiency of the parathyroid plays an important part in Grave's disease.

3. The changes that have been found in some

parathyroid bodies from exophthalmic goitre patients have been noted also by Walsh, Humphrey, Berkeley and MacCallum, after death from other diseases.

4. In nine cases of exophthalmic goitre in which the parathyroid bodies were examined microscopically by MacCallum (16), they were found practically normal; there being at most, in a few of the cases, only a slight diminution in size and an increase in the fibrous stroma.

Shattuck found nothing abnormal in the parathyroids from exophthalmic goitre patients, which he examined microscopically. Benjamins (17) examined the glandulae parathyroidae in sixteen simple and three Basedow's goitres without finding any noteworthy change. "I have had opportunity to examine about 100 presumably normal parathyroids collected by Dr. D. Ferguson and Dr. Rogers in this laboratory (Cornell Univ. Med. Dept.) and find that the variations in structure of the glands, and in the integrity of the cells, cover a range rather greater than that reported by most observers, and quite as extensive as that so far observed in Grave's disease." Ewing.

THE THYMUS THEORY

This theory as an explanation of exophthalmic goitre was suggested by the following facts:

1. In some of the cases of exophthalmic goitre that have come to the autopsy table, this organ was found to be hypertrophied. Dinkler, Joffroy, Soupault (18), Mobius, Spencer, Marie and other authors have commented upon this marked hypertrophy, and have noticed that it is most always associated with great vascularity of the organ.

2. Some cases apparently have been benefited by the use of thymus gland substance, or of some of its preparations.

Our non-acceptance of this theory is based upon the following facts:

1. Our knowledge of the physiology and pathology of the thymus gland is as yet too limited. Very little is known concerning the functions of this organ.

2. Thymus therapy in the opinion of by far the greater number of clinicians is useless in the treatment of exophthalmic goitre.

3. Exophthalmic goitre occurs in the absence of hypertrophy of the thymus.

4. Hypertrophy of the thymus occurs in the absence of exophthalmic goitre.

5. The thyroid theory offers a far better working theory.

MacKenzie states that he treated twenty cases of this disease with thymus extract, and compared them with twenty similar cases treated without thymus, but could see no decided difference in the results obtained.

THE THYROID THEORY

Though it has not been demonstrated beyond scientific contradiction, that in the thyroid gland is to be found the sole primary cause of the disease, we are believers in the thyroid theory, because:

1. There is present some structural alteration of the thyroid body in all cases of exophthalmic goitre. This applies to the secondary as well as to the primary forms of this disease. Most of the recent observers have come to the conclusion that the histology of the thyroid gland in primary Grave's disease is in many respects specific (19). "We must not conclude that because we cannot detect any enlargement that, therefore, the gland is not diseased; it always is" (20).

2. Because exophthalmic goitre is the direct opposite of myxedema in symptomatology, in pathology and in therapeutical indications.

3. Because the symptom-complex of this affection can to a certain degree be determined by the ingestion of large doses of thyroid gland substance, or of its various preparations.

4. Because all medical or surgical measures which tend to decrease the functional activity, or lessen the volume of the gland, also tend to lessen the severity of the symptoms, or to arrest them. Schultze says: "Clinically it makes no difference whether the secretion of the gland is increased, or altered, or is altered chemically as the result of changes in the blood, in the alimentary canal, or in the central nervous system, the fact remains that the removal of the growing gland does away with the symptoms, and upon failure to remove the diseased glands depends the failure to cure." Incidentally we may say that the surest and most efficacious way of reducing the volume of the thyroid body is by removing a portion of it.

5. Because in the cases which we have col-

lected and which we report, recovery from the disease, in rapidity and completeness, has been in proportion to the extent of gland tissue removed, short of its entirety.

6. In those cases where the symptoms recurred, recurrence was associated with, and seemed to be dependent upon, hypertrophic changes in the remaining portion of the gland. Recovery could be secured by a secondary operation, and was secured in those cases that submitted to a secondary operation.

7. Because the symptom-complex of this affection finds its most satisfactory and its most consistent explanation by considering the condition a general toxemia, the result of quantitative or of qualitative changes, or both, in the secretion of the thyroid gland. The tachycardia, the mental changes, the sweating, the prostration, the increase of body temperature, the diarrhea, are all symptoms that we find in other intoxications. It is perfectly possible for a gland to show a great hyper-activity without actual enlargement, as for example, the salivary gland in the state of salivation.

The anatomical changes noted in the primary and secondary forms of this disease are unlike; so unlike that they of themselves make imperative the classification of the disease into primary and secondary forms. In the secondary cases, we agree with Dean Lewis (5) when he says that the goitre in the secondary forms does not differ in structure from the simple or parenchymatous, or other goitre, upon which the Basedow's symptom-complex were grafted. Exophthalmic goitre has been observed in simple goitre, in fetal adenomata, in cysts, and in carcinoma of the thyroid gland. (Bloodgood, Ehrhardt). It has been thought that small tumors of the thyroid gland, the seat of secondary Grave's disease, act as irritants causing an overactivity of the gland, much as a foreign body in the eye will produce an excessive secretion of tears, and the removal of this source of irritation by operation has been followed by a complete relief of the symptoms.

In the primary form of Grave's disease, definite pathological changes are constantly present in the thyroid gland. Kocher and Reinbach, Brissaud and Langhans have denied the above statement, but the existence of these changes have been confirmed by so many competent observers that their occurrence can no longer be contested. (Greenfield (10), Askanazy, Soupault (18), Haemig, Aubarsch, MacCallum (22), and Ehrhardt.) In 28 primary cases of exophthalmic goitre, MacCallum found changes present in the thyroid gland in each instance, although all the glands and all parts of the same gland were not equally involved in all of the cases. It is well to bear in mind that changes may occur in one portion of a gland and not in another. Dean Lewis examined the thyroid gland in four cases of primary exophthalmic goitre, and his findings agree with those of Greenfield, Edmunds, MacCallum, etc. What are these changes, considered as constant and almost as characteristic?

1. Changes in the follicles which are increased in number and which are also changed in size and form. Instead of appearing round or square, when examined microscopically, they appear branched and stellate. Dr. Rodocanachy (23) noted an increase in the number of the alveoli, proliferation of the epithelium and changes in its character. There is presented the appearance of a gland which is working at high pressure. We find an increase in the secretory tissue, for the number of the alveoli is increased and the epithelial cells themselves, instead of being cuboidal, are columnar. Dean Lewis (5) says: "It seems as if the proliferating epithelium following the lines of least resistance, had grown into the follicles. The connective tissue of the follicle is also invaginated so that in many sections the invaginated epithelium with its connective tissue stalk resembles an intestinal villus." In other parts of the gland the follicles are unusually small. Many of the follicles contain desquamated epithelial cells. The secreting area of the vesicles is increased by ingrowths from their walls.

2. Changes in the character of the epithelial cells. The cells are changed from the cuboidal to the cylindrical, columnar type. The epithelial proliferation may be so great that alteration of the shape of the cells results from mechanical pressure. (Edmunds). Many of the cells are in a state of fatty degeneration. (Virchow).

3. Qualitative and quantitative changes in the colloid. The colloid is greatly diminished in amount; it may be absent. This change,

however, has also been noticed in the thyroid gland of patients dying from other diseases. Some of the vesicles instead of containing colloid are filled with cells. Is this disappearance of colloid due to lessened secretion, or does it result from more active removal by the lymphatics? That is still an unsettled question.

4. Increase in vascularity. The blood-vessels are distended and are increased in size; the friability of their walls has been noted and commented upon by many operators. (Kummel, Kocher, Mayo.) This friability increases the liability to primary and to secondary hemorrhages. In this, as in all other active hyperplasia, the enlargement of the nutrient arteries is very evident. No adequate idea of the vascularity of the gland is gained from inspection of the specimen after death, but at operation it is found to be extraordinarily rich in widely distended vessels. This is especially noticeable in the veins.

5. Changes in the connective tissue. There is an increase in the amount of connective tissue. In some cases this increase in connective tissue causes a lobulated appearance in the tumor. The fibrous septa of the gland may show some thickening at a comparatively early date. All the above mentioned histo-anatomical changes may exist in small foci and not throughout the entire gland. Probably this explains why, in some instances, they have escaped the observation of investigators.

THE CONTRAST EXISTING BETWEEN EXOPHTHALMIC GOITRE AND MYXEDEMA

The thyroid gland is an organ essential to the integrity of the human organism. In the absence of accessory thyroid gland or glands, the spontaneous or gradual arrest of function of this body, or its total destruction by disease, or its ablation by the surgeon, will almost, if not invariably, be followed by myxedema, either acute or chronic in type. Post-operative tetany and myxedema are identical, as far as their etiology is concerned; one condition often develops into the other. (Von Eiselsberg) (1). Tetany, it would seem, is a condition of parathyroid insufficiency (Mayo, Rochester, Minn.) to avoid removing all its glandulae parathyroidea, save the posterior capsule of the thyroid gland. They also thereby lessen the liability of injury to the recurrent laryngeal nerve.

The development of impending myxedema can be prevented; its manifestations controlled either by the successful transplantation of thyroid tissue in another part of the body, or by continual injections of thyroid (Vassale), or by prolonged feeding of thyroid gland. (Lanz, Canter) (24).

The above facts are accepted as proofs that myxedema is a disease due to insufficiency, or to absence, of normally functionating thyroid tissue in the system; as ample grounds for consideration of myxedema among the diseases of the thyroid gland.

The demonstration of the fact that in exophthalmic goitre we have a disease which is the diametrical opposite of myxedema in symptomatology, pathology and therapeutical indications, will aid to give credence to the thyroid theory. Let us consider the evidence that contrasts the two diseases.

As to the Essential Symptoms

EXOPHTHALMIC GOITRE

1. Enlargement of the thyroid gland (almost always present).

2. Exophthalmos (a cardinal symptom).

3. Frequent presence of other ocular symptoms, as Von Graefe's, Dalrymple's, Stellwag's, Jellinek and Rosin's, Gifford's (25), etc. Eye symptoms are of great diagnostic value, chiefly by way of confirmation.

4. Excitable and mobile pulse, palpitation, tachycardia. Permanent tachycardia is more commonly met in exophthalmic goitre than in any other affection.

5. Exophthalmic goitre tremor (cardinal symptom). Murray noticed tremor in 111 cases out of 120.

6. Agitation, insomnia, irritability, excitability. A peculiar mental condition of nervousness is a common symptom in exophthalmic goitre.

7. More or less profuse perspiration. Skin fine, soft, moist and warm. Feel better in cold weather. Diarrhea frequent.

8. Typical myxedema may supervene on the subsidence of an equally typical exophthalmic goitre.

MYXEDEMA

1. Atrophy or absence of the thyroid gland (is mentioned in all the reported cases).

2. Recession of the eye-ball not uncommon. In cases not consecutive to exophthalmic goitre, exophthalmos is never present.

3. Absence of ocular symptoms.

4. Sluggish heart action. Bradycardia, a common symptom.

5. Myxedema — absent, except in its rare occurrence in tetany.

6. Apathy, somnolence, dullness of apprehension and of perception.

7. Absence of perspiration even in the warmest weather. Myxedematous skin. Patients always feel cold. Constipation common.

8. Myxedema never precedes exophthalmic goitre.

As to Pathology

EXOPHTHALMIC GOITRE

Glandular hyperplasia, increase in number of follicles.

MYXEDEMA

Follicles are markedly diminished in number; may be absent. In cases where gland is not absent, there is noticed a progressive glandular atrophy (26).

As to Therapeutical Indications

EXOPHTHALMIC GOITRE

The ingestion of thyroid preparations is almost always harmful. It aggravates the symptoms.

All measures which tend to lessen or diminish the amount of thyroid secretion are followed by improvement.

MYXEDEMA

The continual ingestion of thyroid preparations is positively curative.

Implantation of gland tissue, if the latter maintains its integrity, is curative.

The symptom-complex of this affection can to a certain degree be determined by the ingestion of large doses of thyroid gland substance, or of its various preparations. Our knowledge of the physiological action of thyroid gland substance, or of its preparations, is still limited. Tachycardia and increased metabolism constantly result from their ingestion. Toxic doses will cause such symptoms as rise of temperature, insomnia, agitation, polyuria, albuminuria, complete paraplegia, etc., etc. These symptoms we also frequently meet in cases of exophthalmic goitre. The fact that the symptom-complex of this affection can be experimentally determined, produced by the ingestion of thyroid preparations, is no longer contested. In our opinion it forms another important link in the chain of evidence supporting the thyroid theory.

Cunningham administered daily by mouth to a rabbit 1 gramme of thyroid extract; it caused exophthalmos. Lawford has reported one case of exophthalmos due to thyroid feeding. Edmunds (27) found that feeding dogs and monkeys large amounts of thyroid substance could bring on exophthalmos, tachycardia, loss of weight and wasting. Murray (28) obtained similar results. Nothaft (29) reports a case of a patient who took 1000-5 grain tablets of thyroid extract in five weeks. He developed all the symptoms of exophthalmic goitre; upon cessation of the drug all the symptoms promptly disappeared, with the exception of the struma and exophthalmos, which persisted for six months and then gradually disappeared. Doyen performed a partial thyroidectomy in a case of exophthalmic goitre; cure resulted. For some reason or other, the patient took some tablets of thyroid extract, the symptoms of exophthalmic goitre recurred. With suppression of the drug, the symptoms subsided. Béclère (30) observed the development of the symptom-complex of this affection in a myxedematous woman, who had taken at the beginning of the treatment 92 grammes of thyroid extract in 11 days. The drug was discontinued, the symptoms disappeared.

Summary

Kurt Schulze, Kocher, and the Mayos (Rochester, Minn.) have analyzed their respective cases, and we will merely cite their results, for which the reader is referred to the tables. Their combined cases make a total exceeding 270. Since the compliation of the tables, the Mayos (Rochester, Minn.) have operated on 100 additional cases with increasingly felicitous results.

A critical analysis of the other tabulated cases, the authenticity of each of which has been

verified by reference to the original report when accessible (when not, to a reliable report), taken in connection with a study of the voluminous literature of the subject, has convinced me that the following conclusions are justified:

1. Thyroid gland substance, or any of its preparations, should never be administered in the treatment of exophthalmic goitre. Their use in that disease is irrational, and it is almost invariably attended by an aggravation of symptoms (Cases 65, 67, 203). Their use invariably increases the dangers of operative interference (Kocher).

2. As a therapeutic agent in the treatment of exophthalmic goitre, thymus gland substance and its various preparations are useless. Their use is, at times, attended by an aggravation of symptoms (Case 65). They cannot be considered curative agents.

3. Parathyroid extract as a curative agent of exophthalmic goitre has no efficacy (J. J. Walsh, 15). MacCallum (16) says that the alterations noticed in the glandulae parathyroidae do not seem to be constant or sufficiently extensive to support the idea that the parathyroids have anything to do with the development of the disease known as exophthalmic goitre.

4. The medicinal treatment of the disease which we are considering is, the use of belladonna being excepted, in reality, largely symptomatic. For the anemia, arsenic has been given; for the nervousness and restlessness, the bromides; for the tachycardia, digitalis, strophanthus, etc. All these agents are palliative, not one has ever proven to be curative. All forms of medical treatment of this affection, be they hygienic, dietetic, medicinal, organotherapic or electrical in nature, are unsatisfactory, are disappointing. Their comparative powerlessness has induced surgical endeavors to cure the disease. There is not any form of medicinal treatment which has been successful with sufficient frequency to carry conviction of its worth. "Out of 40 cases medicinally treated, in which the patient was seen from time to time or information obtained as to the nature of the disease, 7 died, 2 remained stationary; out of the other 31, only 9 practically recovered." (Murray, 28). In Cases 4, 24, 37, 39, 60, 63, 64, 77, 87, 88, 89, 110, 111, 130, 131, 143, 150, 152, 179, 182, 377, 376 it is definitely stated that the various forms of medical treatment were of no avail. All of these cases were ultimately subjected to operation. Case 60 died of "acute thyroidism." In all the other cases, operation was followed either by amelioration of symptoms, or by complete cure.

5. Serum therapy of exophthalmic goitre is as yet in an experimental state. The results attending the use of "thyroidectin" are not invariably satisfactory. Miller (31), Quine (31), Billings (31) and others have had failures attending its employment. Their use is not devoid of dangers. In some of the cases reported in the tables, after failure attending the use of thyroidectin, partial thyroidectomy was followed by cure. (Case 211, Drs. Hecht and Ries' case).

By serum therapy of exophthalmic goitre is meant the employment of either (a) the serum of thyroidectomized animals, or (b) the serum of animals treated with increasing doses of thyroid extract, or (c) milk, in the dried or liquid form, of thyroidectomized goats. With the use of these different sera, authors report failures and successes.

6. It is now a demonstrated fact that all operative measures which tend to lessen the secretory activity of the thyroid gland, or to diminish the amount of thyroid gland tissue present in the organism, are of value in the treatment of exophthalmic goitre. That method must be chosen which at the time seems to be the least dangerous without sacrificing chances of success. In Case 4, caustics were injected into the gland to induce necrosis of a part of the parenchyma. This procedure is not to be recommended, owing to its inherent dangers. In this case, however, Jones obtained a cure. Ollier (Case 6) injected Tr. Iodi into the thyroid gland. He obtained a permanent, almost complete, cure. Intra-glandular injections are unsafe in exophthalmic goitre. There is the danger of sepsis, of injecting the irritant agent into the blood-vessels, of provoking alarming hemorrhage into the gland (alarming through the compression that it may exert upon the respiratory passages).

The ligation of the thyroidal arteries in this disease was first recommended in 1886 by Woffler. It has been practiced by operators of

such eminence as Roux, Rydigier, Kocher, etc. It is now used only as a preliminary or as an accessory step to partial thyroidectomy. In Cases 30, 33, 34, 43, 44, 45, 81, 82, 83, 84, 87, 89, 145, 146, 147, 148 two or more of the main thyroid arteries were ligated. In Case 30, there was immediate improvement following the ligation of the four arteries. Patient nevertheless died from relapse two months after the operation. All the other cases, excepting Case 148, were either permanently improved or permanently cured. Case 148, in whom both superior and inferior thyroid arteries also had been ligated, died six months after the operation from some unknown cause. The ligation of the four thyroid arteries is liable to determine gangrene of the thyroid gland, is liable to induce thyroid insufficiency. This has occurred to such an authority as Kocher (See Kocher's cases). Rydigier and Trendelenburg have each had cases of acute tetany follow ligation of the four vessels. Hence it is not to be performed. Kocher does not do it any more as he fears that cachexia strumipriva may follow its performance. The objections to ligation of two or three of the thyroid arteries as a routine treatment of exophthalmic goitre are the following:

1. It is a procedure often difficult of execution, the hypertrophied thyroid gland having altered the anatomical relations of the part; the infiltration of the tissues also adds to the technical difficulties. The ligation of the vessels is especially difficult in the retroclavicular and retrosternal varieties of goitre.

2. Owing to the greatly increased vascularity of the organ, branches of the thyroid arteries are liable to be mistaken for the trunks of the vessels.

3. It does not secure as complete nor as permanent mitigation of the symptoms as partial thyroidectomy, and it is, we believe, equally difficult to perform. Ligation of the inferior thyroids is just about as serious a matter as thyroidectomy. Dressman states that improvement is slower after ligature of vessels than after operative treatment on the gland.

Exothyropexy for exophthalmic goitre has been performed with varying results. See Case 76 in which recovery from the operation and from the disease occurred. This operation has been termed "unfinished partial thyroidectomy." Poncet (Lyons) reports cases of exophthalmic goitre treated by exothyropexy, which are not included in our tables. Mickulicz was of the opinion that ligature was more difficult, more dangerous and less efficacious than resection of the struma.

Ligation of the vessels and partial thyroidectomy was performed in one or in several sittings in nine cases (26, 126, 132, 151, 167, 168, 203, 383 and 196). There were no deaths, and all the cases recovered either partially or completely.

Total thyroidectomy was performed thirteen times (Cases 1, 2, 3, 7, 8, 29, 123, 124, 186, 187, 105). Case 187 died of pneumonia; the left recurrent laryngeal nerve had been included in a ligature. All the other cases recovered either markedly or completely from the disease. In Case 124 myxedema developed. Upon the ingestion of thyroid extract, all symptoms of thyroid insufficiency disappeared. Case 123 was a sarcoma of the thyroid. This patient died after a time from general sarcomatosis. He had recovered from his exophthalmic goitre. In the absence of accessory or aberrant thyroid bodies, total thyroidectomy is very liable to be followed by cachexia strumapriva. This explains why the operation is no longer performed by those that know. Post-operative myxedema can always be controlled by the administration of thyroid extract.

Partial thyroidectomy was performed in forty cases of the secondary form of exophthalmic goitre. There was not a single operative death in this series. In all the cases but one, there was either marked or complete improvement (Cases 6, 7, 9, 23, 27, 36, 40, 55, 57, 62, 66, 68, 69, 74, 75, 80, 86, 103, 120, 123, 128, 129, 134, 150, 151, 154, 156, 172, 174, 179, 184, 190, 374, 195, 376, 377, 378, 379, 384). Case 142 died several months later from exhaustion consequent on an empyema.

Partial thyroidectomy was performed in 152 cases of primary exophthalmic goitre. There were eleven deaths in this series. All the other cases made either moderate, marked or complete recoveries. Of the eleven deaths, one (Case 158) occurred on the operating table; one (Case 141) as a result of very free operative hemorrhage; four (Cases 60, 79, 139, 382) from acute thyroidism. Cases 18 and 118 died from acute influenza; the former, two

months after the operation, the latter, ten days after. In the other cases, the cause of death is not stated with sufficient detail. In Case 18 a tracheotomy had been performed three weeks before the operation.

Partial thyroidectomy is as yet the most satisfactory operation for performance in all cases of exophthalmic goitre, be they primary or secondary in type. In cases that survive the operation, it is invariably attended by marked alleviation of symptoms, in many instances by complete and permanent cure. Kocher is of the opinion that partial resection and ligature of the vessels is the most rational procedure. He first ligates the two superior thyroid arteries. This, in his opinion, is easy of execution and makes the subsequent work easier. He then ligates one inferior thyroid artery before extirpating the gland. No more thyroid tissue need be left in situ than is present in the normal organism, that is from 30 to 60 grammes. The surgeons that have, for the cure of this disease, removed the largest quantity of thyroid tissue short of its entirety, are those that have obtained the very best results, both from the standpoint of the number of recoveries as well as from the standpoint of completeness of recoveries. If not enough gland tissue is removed, the maximal benefits are not derived from the operation, as in Ehrich's and other cases. Friedheim (Hamburg) is of the opinion that in the cases in which only an improvement has been noted, there is still too much gland left behind. A small amount of glandular tissue is all that is required to maintain the ordinary nutrition of the body. If too much is removed, thyroid insufficiency may develop (Case 210). When the thyroid gland is not totally removed, the possibility of post-operative myxedema can be said not to exist. Kocher met it only once in 1000 operations for goitre. In this case he removed half the gland, the remaining half atrophied. The symptoms disappeared following the administration of thyroid extract.

7. The secondary forms of exophthalmic goitre, when subjected to partial thyroidectomy, almost invariably recover from the operation and from the disease.

8. Operators disagree as to the most suitable anesthesia for these cases. All the anesthetic agents have their partisans. Fatalities have occurred with all of them. Local anesthetics have the disadvantage of not completely abolishing the perception of pain. General anesthetics have the disadvantage of increasing the cardiac insufficiency, and of frequently being followed by cough which may induce secondary hemorrhage, by vomiting that may soil and infect the dressings on the wound. Kocher recommends local anesthesia; the Mayos (Rochester, Minn.) employ general ether anesthesia in almost all their cases. They are very partial to the use of ether as a general anesthetic in these cases. Kummell uses oxygen-chloroform. Kurt, Schulze and Riedel have seen an acute bronchitis follow operations for exophthalmic goitre in which only local anesthesia had been employed. According to Prof. Fenger, the degeneration of the heart-muscle will account for some of the sudden deaths; while the absorption of thyroid, shock, anemia and general nerve exhaustion will account for most of the other deaths that are not due to the anesthetic.

9. The dangers of partial thyroidectomy in exophthalmic goitre are either avoidable, such as infection and hemorrhage, or unavoidable, such as "acute thyroidism." This latter, also called "thyroid fever", is liable to occur after the observance of all precautions now known to us. We do not yet know how to prevent nor how to cure "acute thyroidism." It is not always fatal. Free drainage of the operative wound is our most serviceable weapon for combating this complication. The nature of the anesthetic, and that of the operation, seems to have little influence in its production. All Basedow's patients seem very sensitive to surgical operations. In the fatal cases of acute thyroidism, there has been a sudden rise of temperature to 105–106° F., a very rapid pulse, extreme excitability and restlessness with great anxiety and distress, profuse sweating and finally collapse and death from heart failure. The most reasonable explanation for this series of symptoms is a sudden poisoning of the entire system by an excessive absorption of thyroid juice suddenly produced during the operation. "In operations on these cases (exophthalmic goitre) there are certain inherent dangers that no amount of cleverness can avert." Mayo (32).

10. There is no doubt that the mortality is greater in bad cases than when the symptoms are slighter and the patient in better condition. Early operations give the best results. They give a lower percentage of deaths and a very much higher percentage of cures. Exophthalmic goitre tends to diminish vital resistance and to exhaust the nerve centers, hence operate before the patient's vitality has been lowered by chronic thyroid intoxication. Kocher lays great stress on the avoidance of the development in all cases of goitre of what he calls the "thyroid heart." This, he asserts, can be acquired either by waiting too long for surgical intervention, or by an excessive iodine or thyroid extract therapy. He assures us that the prognosis in Basedow's disease will be much better in the future, if the operation is done early. In Schulze's cases (212–262) all deaths but one occurred in patients in whom the cardiac conditions were bad. In very severe cases, successive operations at different sittings can be done with benefit to the patient. This is well exemplified in some of Kocher's cases.

11. Operative points:

1. It is well to prepare patients for some time, to observe them and to better estimate their ability to withstand operation. Before operation all cases should be examined with the laryngeal mirror, so as to determine if one or both laryngeal nerves are compressed by the thyroid growth. This will save yon much post-operative concern.

2. Use the inverted Trendelenburg position. Put the neck in that position which makes the goitre most accessible and which interferes least with respiration. A hard round pillow is put under the neck.

3. Kocher's transverse-convex incision allows of a complete exposure of both lobes. From an ultimate cosmetic standpoint it is the best, as the usual neckwear will hide the scar. The Mayos (Rochester) advise a high section of the sternohyoid and sternothyroid muscles so as to preserve the nerve supply to these structures. "The saving of the posterior capsule protects against many of the dangers of thyroidectomy. Mayo (32). Suture the transverse skin wound accurately. Drainage tube is made to escape below.

4. Hemostasis must be effective. Do not depend on temporary compression to arrest the bleeding. It is deceptive. If possible, tie the vessels. It is preferable to leaving clamps in position — clamps interfere with healing of wound. Nurses should be instructed to watch for the first symptoms of secondary hemorrhage.

5. Tissue should be left at the poles of the gland, preferably about the inferior thyroid arteries, so as to reduce the risk of injuring the recurrent laryngeal nerves.

6. Post-operatively: Patient should be kept mentally, physically and emotionally quiet. Wound should be drained freely. Drainage is all-important. *a.* To remove what primary wound secretion is present. *b.* To remove what contents of the gland have been expressed into the wound during the operation. A certain amount of the toxic secretion of the gland being allowed to accumulate slowly in a wound that is closed will often cause such symptoms as may prove fatal in an otherwise successful case. Do not fail to swab mucus away from throat. There is always a hypersecretion of mucus, giving rise to troublesome coughing which is one of the reasons why the vessels should be well secured for avoidance of secondary hemorrhage.

12. Recovery from all the symptoms is neither immediate nor simultaneous. The first symptom to subside is the tachycardia. The tremor and the nervous and psychical symptoms also disappear quickly.

The total disappearance of menstrual disturbances is of good prognostic omen. It takes months for the entire beneficience of the operation to become manifest. In many cases the improvement is slow in becoming apparent; for instance, in Case 166, slight, if any, improvement, was present at the expiration of nine months. Then betterment began and gradually increased so that at the end of four years it was complete. The exophthalmos is the last symptom to disappear. Albert Kocher says that a total disappearance of exophthalmos can only be expected in those cases in which the operation is performed early. Eye symptoms disappear in the majority of cases quickly and completely irrespective of persistence or disappearance of exophthalmos. The longer the period of observation after the operation, the better appear the results.

13. When, after a partial thyroidectomy, the symptoms recur, the recurrence is most frequently associated with a hypertrophy of the remaining portion of the gland (Cases 136, 208, 210, 378, 38, 54). Removal of a portion of this will bring about a cure (Cases 136, 208, 210, 378, 54). In Case 210, after second operation, symptoms of tetany appeared, but disappeared completely after ingestion of thyroid extract.

14. Partial thyroidectomy is indicated, —

1. In all cases of Secondary Exophthalmic Goitre.

2. In all cases of Primary Exophthalmic Goitre, —

(*a*) When after three months of well conducted, appropriate, medical treatment, the patient's condition is not markedly improved.

(*b*) When the goitre compresses or distorts the trachea, or the esophagus, or both (Cases 5, 7, 12, 13, 14, 42, 66, 67, 71, 80a, 91, 110, 123, 155, 156, 184, 189, 211, 376, 381, 382). Long-continued dyspnea is very liable to beget pulmonary emphysema.

(*c*) When tachycardia is marked (Cases 103, 111, etc.). Long-continued and excessive tachycardia is very liable to beget organic heart changes.

(*d*) When exophthalmos is so marked as to prevent complete closure of the lids during sleep (Cases 19, 86, 115, 126, 183, 199). Kocher and others report cases where patients lost their eyesight through ulceration of the cornea, secondary to marked exophthalmos.

(*e*) If the patient is losing strength.

(*f*) In all acute cases that seem like a sudden intoxication of the body by thyroid, even when no marked enlargement of the thyroid body can be demonstrated (Rehn, Nonne Von Eiselsberg).

15. Surgical treatment of Exophthalmic Goitre is justified by theory and by facts.

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No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
1-3.	P. H. Watson. Edin. Med. Jour., Sept., 1873–74, vol. xix, p. 252.		Removal of thyroid gland. Excessive hemorrhage. Ligation of vessels as preliminary to excision of tumor through same incision as that by which extirpation of goitre is made.	Immediate relief of anemia and exophthalmos.	Good.
4.	Jones. Brit. Med. Jour., Dec. 10, 1874.	Primary. Patient was in a pitiable condition. Goitre measured 6½″ from side to side and 3½″ deep, involving entire gland. Medical treatment of no avail.	Caustics. Induced suppuration of gland.	Improved.	Two years after patient was much improved. No palpitation; still some exophthalmos. Goitre greatly reduced. Uterine functions restored.
5.	Lister. Operated in 1877. Cited by Fraser. Edin. Med. Jour., 1887, vol. xxxiii, p. 347.	Primary. Interfered with deglutition and respiration.	Cut away the bulk of the enlarged thyroid and used a sharp spoon to remove the adherent portions.	Early improvement. Five days after operation pulse had been reduced from 130 to 72. Exophthalmos markedly improved.	Ten years later showed no recurrence.
6.	Ollier. 1877. Cited by Heydenreich. Semaine Médicale, 1895, vol. xv, p. 269.	Secondary. Cystic Goitre.	Divided skin, opened cyst and injected Tr. Iodi.	Immediate improvement. Pulse in a few days fell from 160 to 70.	Two years after, all symptoms had disappeared, outside of slight exophthalmos.
7.	Tillanx. Bull. de l'Acad. de Méd., Paris, Apr. 27, 1880, vol. ix, p. 401.	Secondary. Compression of trachea and esophagus.	Chloroform. Total ablation of the thyroid gland.	Immediate improvement of symptoms followed operation.	Three years after operation patient substantially cured.
8.	E. Herskind Schmidt. Jahrbuch der gesammten Medicin, vol. ccxlvii, p. 25. Von Koch. Centralblatt für Nervenheilkunde, März 1895, vol. xviii, p. 128.	Primary. (Man.)	Strumectomy according to Kocher's method.	Recovery.	Complete recovery.
9.	Dubreuil. Gaz. Méd. de Paris, 1887, vol iv. No. 34, p. 397.	Secondary. Pre-existing cystic goitre.	Chloroform anesthesia. First aspirated cyst and removed 200 grammes of coffee-colored liquid; then enucleated cyst.	Substantially a complete cure.	
10.	Wolff, Julius. Berlin. Klin. Wochenschrift, 1887, vol. xxiv, p. 510.		Partial thyroidectomy. Extirpated mass weighed 260 grammes.	Recovery.	Recovery complete.
11.	do.	Primary.	Partial thyroidectomy. Mass taken out weighed 37 grammes.	Healed in 12 days.	Recovery.
12.	do.	Compression of trachea.	Removal of right lobe of thyroid.	Recovery.	Recovery.
13.	do.	Compression of trachea.	Partial thyroidectomy.	Recovery.	Patient said she felt as if "she had been born anew."
14.	do.	Primary. Compression of trachea.	Removal of one lobe, weight 133 grammes. Both lobes diseased.		Improved.
15.	Wolff, Julius. Deutsche Med. Wochenschrift, 1893, vol. xix, p. 245.		Right lobe and isthmus removed. During the course of anesthesia there was irregular breathing and marked cyanosis. Condition necessitated a tracheotomy.	Recovery.	Recovery.
16.	Weidmann. Ref. Mannheim, L. C.		Partial thyroidectomy.	Recovery.	Cured.
17.	Lemke. Deutsche Med. Wochenschr., 1891, No. 2.	Primary.	Removal of left lobe of goitre.		Substantially a complete cure.
18.	Lemke. Deutsche Med. Wochenschr., 1892, No. 11.	Primary.	Tracheotomy, three weeks later extirpation of right half of gland.		Death from acute influenza two months later.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
19.	Ibid.	Primary. So great was the exophthalmos that the woman was called "Die Frau mit den Augen."	Extirpation of right half of gland.		Great improvement.
20.	Caird. Edin. Med. Chir. Soc., 1891, vol. vi, p. 17.	Corneal ulcerations present.	Excision of right lobe of thyroid gland.	Great improvement. The cornea healed with great rapidity. There was a diminution of exophthalmos. Marked nutritional improvement.	A year after she was in good condition, though still suffering from some headache and palpitation.
21-22.	Bottini. Centr. für Chirurgie, 1893, vol. xx, p. 714. 2 cases.		Total extirpation of thyroid gland.	Recovery. All symptoms disappeared.	Ten months after, no recurrence. No cachexia strumipriva.
23.	Delore. Lyon Médical, 1906, vol. cvi, p. 624.	Secondary.	Removed retrosternal cystic goitre.		Recovery.
24.	J. Arthur Booth. Jour. of Nervous and Mental Diseases, 1894. vol. xxi, p. 258.	Primary. Medical treatment had proven unavailing.	Right lobe of thyroid was removed.	Recovery. There was a steady improvement of symptoms.	The left side of thyroid diminished to a slight extent after the operation.
25.	J. Arthur Booth. Medical Record N. Y., 1896, vol. l, p. 45. Op. by B. F. Curtis.	Primary. Condition had lasted six years. Patient had been progressively getting worse, so that at time of operation she was unable to attend to even minor household duties.	Removed the right lobe of the thyroid gland.	Recovery from the effects of the operation was rapid.	Improvement of all the symptoms. Edematous swelling of the lids persisted.
26.	Stockman. (Koenigsberg) Gazette des Hôpitaux, 1894, vol. lvii, p. 832. Deut. Med. Wochenschr., 1894, vol. xxvi, p. 141.	Primary. Of eight years' duration.	She was operated upon three times; the first time, ligation of superior thyroid artery; second time, ligation of inferior thyroid artery; finally, extirpation of left lobe of thyroid gland.	Recovery.	One year after operation cardiac symptoms have disappeared. A slight exophthalmos persists.
27.	Stierlin, R. Arch. f. klin. Chir., 1892, vol. xliv. Cited by Wette.	Secondary.	Removal of right lobe.		Substantially a complete cure.
28.	Newton. Jour. Mental and Nervous Diseases, 1894, p. 259.	Primary. Patient was only 12 years old. Before operation pulse rate 180.	Almost complete extirpation of gland performed. All but small portion removed.	Improved.	Was improved in every way. Six months after operation patient's pulse was reduced to normal. Exophthalmos, which had been very pronounced, had completely disappeared.
29.	Péan. Schmidts Jahrbuch der gesammten M., 1894	Primary.	Subcapsular thyroidectomy.	After operation the pulse, which previous to operation had been very high, fell to 90.	General improvement of all symptoms.
30.	Lavisé. Bull. Méd., 1893. No. 48. Centralblatt für Nervenheilkunde und Psychiatrie, 1893. vol. xvi, p. 529.	Primary.	Ligation of the four arteries.	Immediate improvement.	Relapse and death two months after operation.
31.	Ruppreicht. 1890, p. 63. Jahresbericht der Gesellschaft Natur-u. Heilk., Dresden.	Primary. (Man.)	Enucleation of goitre.	Rapid improvement.	Substantially complete cure. Exophthalmos disappeared in four weeks. Patient well.
32.	Sprengel, J. B. Schmidts, vol. ccxxix, p. 138.	Primary.	Partial thyroidectomy.		Cure complete, but exophthalmos unchanged.
33.	Mazzopust. Centralb. f. Chir., 1893. p. 715.	Primary.	Ligation of thyroid arteries.	Thyroid gland diminished in size. Exophthalmos disappeared.	Improved.
34.	Billroth. Arch. f. klin. Chir., No. 44, p. 785.		Ligated the inferior thyroid arteries.	No details given.	Cured.

No.	Operator's Name & Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
35-36.	Maydl. Gaz. des Hôp., 1895, vol. lxviii, p. 834.	Case 1. Primary. Chloral-chloroform anesthesia. Case 2. Secondary. Chloral-chloroform anesthesia.	Partial thyroidectomy. Partial thyroidectomy.	Recovery. Immediate improvement.	Marked improvement, became complete. After a period of improvement symptoms recurred. She died suddenly one year later.
37.	Hahn. Reported by Neumann, Deut. Med. Wochenschr., 1893.	Primary. Patient also had phthisis pulmonalis. Was treated medically with little or no benefit for two years.	Resection of portion of thyroid gland after Kocher's method.	Recovery on third day after operation, pulse from 160 to 96–98 per minute. No palpitation.	One year after operation pulse fallen to normal. Exophthalmos had disappeared.
38.	Lossander. Jour. Mental and Nervous Diseases, 1894, p. 359, vol. xxi.	Primary.	Partial strumectomy in Stockholm.	Improved.	Patient was able to return to work for about two years, then disease recurred. At time of recurrence thyroid showed much enlargement. There was dyspnea and palpitation. She was seen by Putname of N. Y. at that time.
40.	Morestin. Bulletin de l' Académie de Médécine, Paris, vol. xxxxi. p. 659.	Secondary.	Partial thyroidectomy.	Recovery.	Radical cure of all nervous symptoms, of tachycardia, of exophthalmos.
41.	Picque. Revue de Chir., Paris. 1898, vol. xxiv, p. 748.	Primary.	Extirpation of the goitre.	Recovery.	One year after tachycardia had entirely disappeared.
42.	Martin, Albert. Intercolonial Med. Congress of Australasia, Dunedin, New Zealand, 1896.	Some compression of trachea.	Partial thyroidectomy.	Recovery.	Recovery.
43-54.	Mikulicz. Berliner klin. Wochenschrift, 1895, p. 420. 11 cases.	1 without goitre, but with lymphangioma. 7 diffuse hyperplastic goitres. 2 cystic goitres. 1 hypervascular goitre.	In three cases ligation of arteries (1 unilateral and 2 bilateral). In three cases enucleation by method of Socin. In three cases bilateral resection. In two cases unilateral resection.	All recovered from operation.	6 cured watched from 1 to 9 years. 4 improved watched from 2 to 12 months. 1 case improved after removal of ½ of gland, followed by relapse. Cured by removal of the other half.
55.	Neumann. Deutsche Med. Wochenschrift, 1893, vol. xix, p. 951.	Secondary.	Partial strumectomy.	Recovery. Acute thyroidism after operation.	Marked improvement of all symptoms.
56.	Gerster. (1895). Rev. Neurol., 1895, July 14.		Excision of right lobe of thyroid gland.	Improvement.	Recovery.
57.	J. O. Closs. Intercolonial Med. Congress of Australasia, Dunedin, New Zealand, Feb. 1896, p. 160.	Secondary. Pulse 90–100.	Removal of right half of thyroid gland.	Recovery. Was able to sit up on 12th day.	No symptoms had recurred two years after. Pulse 70–78.
58.	do. 1896, p. 161.	Primary. Pulse 150.	Right half of gland was removed.	Four days after operation temperature was normal and pulse was 84.	Seen several months after, though patient's health was much improved, she was still somewhat nervous.
59.	do. 1896, p. 161.	Primary.	Right half of thyroid gland was removed.	Recovery. Before the operation the pulse was 120, 24 hours after it was 83 per minute.	Seen one year after, there was a total absence of Grave's disease.
60.	Lejars (Paris). Bull. et Mémoires de la Société de Chir. de Paris, 1897, vol. xxiii, p. 120.	Primary. Patient had gotten worse under medical treatment.	Ether anesthesia. Partial thyroidectomy.	Death on day of operation. Autopsy did not reveal cause of death. Acute thyroidism.	
61.	Desguin. (Anvers) Bulletins et Mémoires de la Société de Chirurgie de Paris. 897, No. 56, p. 672.	Primary.	Thyroidectomy.		Practically cured.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
62.	Walther. Gazette Hebdomadaire de Médécine et de Chirurgie, Paris, 1897, vol. 11.	Secondary. Had had plain goitre for 15 years previously. Basedow's symptoms had developed recently.	Partial thyroidectomy.	Recovery.	One year after all symptoms had disappeared, with exception of astasia-abasia.
63.	Pilcher, Lewis S. Brooklyn Med. Jour., 1904, vol. xviii, p. 319.	Primary. Medical treatment unavailing. Pulse 110–200 beats per minute.	Ether anesthesia. Left lobe and isthmus removed. Free drainage was provided.	The day after the operation the patient's pulse fell to 80 per minute.	Two months after the operation, the improvement was satisfactory and persistent. There was restoration of nervous tone.
64.	Tuffier Bull. et Mém. de la Société de Chirurgie, Paris, 1897, vol. xxiii, p. 180.	Diagnosed by Charcot and Gilles de la Tourette as primary Basedow's disease. Was treated medically for two years with no improvement of symptoms. Condition serious. Intra-glandular injections of Tr. Iodi procured no results.	Hemithyroidectomy.	Immediate improvement noted.	Seen three years after operation, all symptoms had disappeared.
65.	Tuffier. do. Case 2.	Primary. Thyroid extract had been used and had much aggravated the symptoms. Under thymus extract patient had gotten worse. Patient was in a critical condition.	Used chloroform. Partial thyroidectomy.	Immediate improvement in all symptoms.	Reported three months after operation, patient was still improving.
66.	O. Vanderlinden et De Buck. Bull. de l' Académie Royale de médécine de Belgique. 1897, vol. 11, p. 488.	Secondary. Left lobe hypertrophied and cystic. Trachea badly displaced to right.	Resection of left lobe.	Immediate improvement.	Resumed her work.
67.	do.	Primary. For 5½ weeks patient had been given Iodothyrine. Result was an aggravation of symptoms Compression of trachea.	Extirpation of median and left lobes.	Slow improvement.	One year after, complete recovery.
68.	do.	Secondary.	Partial thyroidectomy. (No details.)	Recovery.	
69.	do.	Secondary.	Partial thyroidectomy. (No details.)	Recovery.	
70.	McCosh, A. J. Annals of Surgery. Philadelphia, Pa., 1895, vol. xxii, p. 793.		Partial thyroidectomy.		Recovery. Great improvement in all symptoms.
71.	Sulzer, Max. Deut. Zeitschr. für Chirurgie, 1893, vol. xxxvi, p. 209.	Primary. Marked case.	Excised isthmus; this produced no result outside of relieving dyspnea. Then extirpated one half of gland.	Recovery.	9 years after operation, palpitation, exophthalmos and tremor had disappeared.
72.	do. p. 193.		Partial thyroidectomy.	Recovery.	12 years after operation, outside of slight exophthalmos. Recovery maintained itself.
73.	do.		Enucleation of cyst and nodules.	Recovery.	Seen three years after; all symptoms absent except slight tremor.
74.	Emmet Rexford. Annals of Surgery. Philadelphia, Pa., 1902, vol. xxxvi, p. 397.	Secondary. Has had cystic goitre since childhood.	Local anesthetic with morphine. Removed left half of gland with isthmus.	Pulse went up; fell on 8th day; then improved. Patient remained well and gained 20 lbs. in 2 months; then right lobe of thyroid began to enlarge; symptoms returned.	
75.		Secondary. Pulse 140. Very severe case.	Local anesthetic. Shelled out tumor from thyroid gland.	Four days after, pulse 95.	7 months after did her washing and ironing.
76.	E. Boinet. Rev. de Neurol., Par., vol. viii, p. 141.	1896, 1897 and again in 1897.	Bilateral resection of cervical sympathetic. Partial thyroidectomy.	Not any of these operations were productive of any good to the patient.	No improvement. No improvement. No improvement.
77. 78.	Doyen, Rheims. Revue de Thereutique. Médico-chirurgicale, vol. lxiv, p. 537. Paris.	Primary. After complete failure of medical treatment. Wife of a physician.	Partial thyroidectomy; leaving thyroid tissue of the volume of an almond. Left a lobule of thyroid tissue about 15 mm. in diameter.	Recovery. Recovery.	Patient seen 2½ years after operation. Recovery maintained itself. Seen four months after operation and was in perfect health.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
79.	Putnam, Jas. J. Jour. Mental & Nervous Diseases, 1894, p. 359.		Ether anesthesia. Unilateral thyroidectomy. A very small gauze wick was left in wound.	Improved.	Death on 7th day with pyrexia. "Acute thyroidism."
80.	Coley, Wm. B. Annals of Surgery, Philadelphia, Pa., 1895, vol. xxii, p. 793.	Secondary. Examination showed that it was a cystic adenoma of a highly vascular type.	Removed left half of thyroid.	Recovery rapid.	Improvement in all symptoms.
81.	Riedel. Cited by Wette, Arch. f. klin. Chir., 1892, vol. xliv. p. 796. 3 cases.	Primary. Patient in serious condition. Compression of trachea causing stridor, in third case.	Removal of largest half of goitre.		Substantially completely cured.
82-85.	Roux, Festschrift. Kocher, Wiesbaden, 1891. 4 cases.		Ligation of arteries. Four cases. Partial thyroidectomy (1 case).		Improved or cured. Cure.
86.	Riedel. Lancet, 1901, vol. i, p. 1453.	Secondary.	Right half of parenchymatous goitre was removed.		Recovery. 3 years after patient was seen again, the palpitation was completely cured; at a ball, could take part in every dance; exophthalmos and emaciation were gone.
87.	Dressman. Deutsche Med. Wochenschr., 1892, vol. xviii, p. 90. Operated by Kocher.	Primary. Medical and electrical treatment used in vain.	Ligature of the thyroid arteries.		Marked improvement. All symptoms disappeared.
88.	Ibid. Operated by Trendelenburg.	Primary. Medical treatment of no avail.	Ligature of the two superior thyroid arteries. Several months later ligated the two inferior arteries.	Great improvement.	Slight exophthalmos remains; likewise slight remnant of goitre.
89.	Ibid. Operated by Trendelenburg.	Primary. Medical treatment of no avail.	Ligature of four thyroid arteries.	Great improvement.	Slight exophthalmos and small remnant of goitre remains.
90.	Riedel. Cited by Wette, Arch. f. klin. Chir., 1892, vol. xliv, p. 496.	Primary.	Removal of goitre.		Substantially complete cure.
91.	do. Vol. xliv, p. 796,	Primary. Compression of trachea causing distressing stridor.	Enucleation of multiple nodules.		Gradual and steady improvement.
92-100.	Shuttleworth, Chas. B. Canadian Prac. and Review, vol. xxx, 1905, p. 361. 9 cases.	No details.		7 recoveries. 2 deaths. 1 at time of operation. 1 four months after.	
101.	Sickinger. Centralblatt f. Chir., 1893, p. 1091.		Removal of right lobe of thyroid body.	Recovery. Improvement gradual.	Patient greatly improved but not entirely cured.
102.	Rehn. Berlin. klin. Wochenschrift, 1884, p. 183. Case 1.	Primary.	Strumectomy.	Recovery.	1½ years after pulse was 80; all other symptoms gone.
103.	do. Case 2.	Secondary goitre of 8 years' standing. Delirium cordis.	Chloroform and ether anesthesia. Goitre extirpated.	Recovery.	12 days, pulse 80; other symptoms gone. One year after, well.
104.	do. Case 3.	Primary. Disease of 3 years' standing.	Removed half of gland and the isthmus.	Recovery.	All symptoms gradually disappeared.
105.	Rehn. Berlin. klin. Wochenschrift, 1884.		Extirpation of whole thyroid.	Recovery.	Paresis of recurrent nerve disappeared; lasted four months after operation.
106.	Ibid.		Removal of diseased lobe.	Temporary increase of tachycardia and dyspnea, which disappeared at end of week. Pulse normal.	Recovery. At end of one year doing hard work.
107.	Ibid.		Thyroidectomy right half.	Improved.	Improvement maintained.
108.	Ibid.		Thyroidectomy left half.	Improved.	Improvement maintained.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
109.	Beck, C. Abstract La Semaine Médicale, Paris, Juillet, 1905, p. 340. 3 cases.		Hemithyroidectomy in all.		Marked improvement in all.
110-117.	Lemke. Deutsch. Med. Wochenschrift, 1894, p. 809. Case 1.	Under medical treatment for two years.	Removed ¾ of struma; tracheotomy to relieve asphyxia.	Pulse 80, exophthalmos gone.	Recovery.
	Case 2.	Under medical treatment for years. Pulse so rapid could not be counted.	Partial thyroidectomy.		Recovery maintained. Graefe's sign still persists.
	Case 3.	Bad case. Tracheotomy; delirium cordis.	Partial thyroidectomy.	Recovery from operation.	Good improvement from the signs of the disease. Death on 14th day from influenza.
	Case 4.	Female.	Partial thyroidectomy.		Complete recovery.
	Case 5.	Female. Marked exophthalmos. General tremors; irritable.	Operation difficult and bloody. Removed right half of struma. Tamponed wound with ci_3 gauze.		Two years later patient completely cured.
	Case 6.	Female. Primary. Marked mental involvement.	Right half of struma excised. Tampon of iodoform gauze placed in wound.	Patient unmanagcable and tore off bandages.	Two years later marked improvement.
	Case 7.	Marked dyspnea.	Removed right half of thyroid.	Wound healed in 14 days.	Recovery.
118.	Pilcher. Brooklyn Med. Jour. Aug. 1894, p. 319.		Left lobe and isthmus removed.		Five months after, improvement persisted and condition was satisfacory.
119.	Peterson's N. Y. Med. Jour., Nov. 24, 1894, vol. lx. Operated by Dr. H.	Primary.	Resection of left lobe.		One year later diminution of symptoms. Five years after patient seen, complete disappearance of all symptoms. Works hard.
120.	*Curtis, B. Farquhar. Annals of Surgery, Philadelphia, Pa., 1903, vol. xxxviii, p. 161.	Secondary.	Ligation of right superior and inferior thyroid artery, and division of cervical sympathetic near second ganglion. This was not followed by lasting improvement. Two months later, ligation of left superior thyroid artery. Three months after, removal of right half of thyroid.	Recovery.	18 months after last operation, recovery maintained itself.
121.	do.	Primary.	Cocaine anesthesia was tried, but patient was hyperesthetic and absolutely uncontrollable. Chloroform had to be administered. Right half of thyroid was removed.	Patient died about four hours after operation.	
122.	do.		May 5, 1905, under cocaine anesthesia right half of thyroid was removed.	Recovery.	In Sept., 1905, she writes that she is well. No dyspnea, no tremor of fingers, eyes less prominent.
123.	Tillaux. Mém. et Bull. de la Société de Chirurgie, Paris, 1881, vol. vii, p. 699.	Secondary. After removal microscopical examination showed growth to be a sarcoma of thyroid gland. Compression of trachea, of esophagus and recurrent laryngeal nerve.	Total thyroidectomy.	Recovered from the symptoms of exophthalmic goitre.	Later died from generalized sarcomatosis.
124.	Quénu. Mém. et Bull. de la Société de Chirurgie, Paris, 1897, vol. xxiii, p. 124.	Primary.	Total thyroidectomy.	Improvement of symptoms; pulse fell from 130 to 52; dyspnea was relieved in about 15 days. Myxedema developed. Improvement from this condition followed administration of thyroid gland extract. Two years after patient became pregnant.	Recovery.
125.	Schwartz. Bull. et Mém. de la Société de Chirurgie, Paris, 1897, vol. xxiii, p. 179.	Primary. Tumor in right lobe.	After incision of the capsule composed of thyroid tissue, and which was followed by profuse hemorrhage, the tumor was enucleated.	Recovery.	Patient was seen one year after, none of the symptoms had recurred.

*This author reports, in addition, eleven other cases of thyroidectomy, that is fourteen cases altogether, with four deaths. In the above series of eleven cases the operator had "three deaths (all due to acute thyroidism without wound complication), six cures, one improved, and one lost sight of."

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
126.	Dr. Tuholske. Interstate Med. Jr., St. Louis, 1905, vol. xii, p. 211.	Primary. Patient male, age 24.	Ether anesthetic. Kocher's angular incision; inferior thyroid artery ligated; excision of the two halves of gland.	Wound healed promptly.	Fair recovery. No tachycardia, no tremor, still slight exophthalmos.
127.	Jos. Ransehoff. The Lancet-Clinic, Cincinnati, O., 1905, vol. xciii, p. 673. Case 1.	Primary. Age 23.	Ether. Removal of right lobe.	Recovery.	Three years later patient was well and fully able to do her work as a maid. The left palpebral fissure was still widened.
128.	do. Case 2. Age 33.	Secondary. Has had goitre ten years. Exophthalmic goitre had supervened a few years previous to admission to hospital.	Operation under cocaine anesthesia. Partial strumectomy. A part of enlarged right lobe was left.	Uninterrupted recovery.	A month after operation the exophthalmos was still present. The patient feels that she has entirely recovered.
129.	do. Case 3. Age 46.	Secondary. Had had goitre for ten years, but only for 3 years had she had ex. goitre. Internal medication, including repeated rest cures, have been of no avail.	Partial thyroidectomy. All of right and part of left lobe being removed with collar incision.	Recovery.	Seen one year after. Entire absence of tumor. Ocular symptoms are not noticeable. She has regained her weight and has taken full charge of her household duties.
130.	do. Case 4. Age 34.	Primary. Has been treated for six years by various physicians without success. Has lost a great deal in weight. Her weight was eighty pounds. Was in very bad condition.	Partial thyroidectomy, involving right and left lobe, leaving the structure of the isthmus in place.	Recovery.	Seen 1 year after, weight 135 lbs. No recurrence. Widening of palpebral fissure of left eye is still perceptible.
131.	do. Case 5. Age 19.	Primary. Has been treated by internal medication and local treatment without avail.	Cocaine anesthesia. The entire right lobe and the pyramidal lobe which was enlarged, removed.	Recovery.	Seen one year after. Marked improvement. Not a complete recovery, however.
132.	do. Case 6. Age 16.	Primary. Two years' duration.	Chloroform. Ligation of superior and inferior thyroid vessels, followed by removal of entire right lobe.	Recovery.	Eleven years after, no recurrence. No trace of exophthalmos.
133.	Gausen. Schmidt's Jahrbuch, 1890, p. 138. 2 cases.		Partial thyroidectomy. Details not given.	Recovery.	Unimproved.
134.	Schwyzer, Gustav Northwestern Lancet, Minneapolis, 1905, vol. xxv, p. 61. Case 1.	Secondary.	Removal of a solid parenchymatous struma.	Recovery.	Normal conditions were reestablished.
135.	do. Case 2.	Primary.	Partial thyroidectomy.	Recovery.	One year after, symptoms disappeared, with exception of exophthalmos which had not entirely left.
136.	do. Case 3.		Resection of right half of gland.	Recovery.	Recurrence. A resection of half of left lobe was followed by recovery.
137.	do. Case 4.	No details.		Death six hours after operation.	
139.	J. O. Closs. (1895) Intercol. Med. Cong. of Australasia, Dunedin, New Zealand, 1896, p. 161.	Primary.	Whole of right half of left lobe was removed. Difficult operation owing to gland being wrapped around trachea.	Died on night of operation. Temperature suddenly shot up to 103.2 with the pulse going at a tremendous rate. I should say 200 a min. She was wildly delirious, full of hallucinations. Had to be restrained in bed.	
140.	T. G. Witherspoon, St. Louis. Jr. of A. M. A., 1903, vol. xli, p. 228.	Primary.	Partial thyroidectomy.	Good recovery.	Two years after was well and strong. She was able to attend to her duties. None of the former symptoms were present.
141.	do.	Primary. Patient was practically bedridden and very weak.	Right lobe removed. Very free hemorrhage occurred from the inferior thyroid artery.	Death.	
142.	do. Case 1.	Secondary. Had had goitre for 20 years. Grave's disease was of 3 years' standing.	Right thyroid lobe was the larger and was removed.	Recovery. Marked improvement in symptoms.	Died several months after from exhaustion consequent on an empyema.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
143.	T. G. Witherspoon, St. Louis. Jr. of A. M. A., 1903, vol. xli, p. 228. Case 2.	Primary. Had been under medical treatment for several years, but had not been benefited by it.	Chloroform anesthesia. Removed right lobe of thyroid.	Recovery. Marked improvement. Exophthalmia gone.	Recovery.
144.	do. Case 3.	Primary.	Local anesthesia. Removed right lobe of thyroid.	Marked improvement. She had a slight tetanic attack while the dressing was being placed on the wound.	Recovery.
145.	Schwyzer, Gustav M. D., St. Paul Med. Jr., 1904, vol. vi, p. 1. Case 1. Female.	Extremely severe case.	Ligation of both inferior thyroid arteries, and one superior, besides a large branch from the hyoid.	Recovery.	Slow but complete cure since 5½ years.
146.	do. Case 2. Female.	Extreme case.	Ligation of three thyroid arteries.	Recovery.	Prompt cure, now lasting over 3 years.
147.	do. Case 3. Female.	Severe case.	Ligation of both abnormally large sized superior thyroid arteries. Left lobe peeled in search for left inferior artery which was not found.	Recovery.	Slowly progressing, complete cure 2 yrs. and 8 mos.
148.	do. Female.	Severe case.	Ligation of both superior and right inferior thyroid arteries.	Four months after operation almost complete cure.	Two or three weeks later death from unknown cause.
149.	do. Case 5. Female.	Mild case.	Excision of right lobe.	Recovery.	Cure, with exception of only partial improvement of the unilateral exophthalmos. Time elapsed since operation 1 year.
150.	Sir Wm. Stokes. Lancet, London, 1901, vol. 1, p. 1453.	Primary. Male. Had suffered six years. Medical treatment had been tried.	Central mass and part of one lobe removed.	Marked improvement followed operation.	Patient ultimately recovered. Two years after there had been no recurrence of symptoms.
150 a-164.	Frank Hartley. Annals of Surgery, Phil., 1905, vol. xlii, p. 33. Case 1.	Secondary. Colloid struma. Pulse 134.	Gas, ether, morphine. Right lateral lobe, isthmus and middle lobe removed. Method employed practically that of Kocher.	Immediate results. Nervousness and heart action better. Pulse 90.	Seen seven years after operation, best of health; exophthalmos and tachycardia disappeared. p. 75–80.
151.	do. Case 2.	Secondary. Colloid struma. Pulse 130–140.	Gas and ether. Extirpation of the right lateral lobe and isthmus. Ligature of left superior thyroid artery.	Four days after operation pulse 90, no palpitation.	7 years and 5 months after operation continued improvement. Exophthalmos gone.
152.	do. Case 3.	Primary. Parenchymatous goitre. Medical treatment ineffectual. Pulse varies between 110 and 160.	Gas, ether and morphia. Removal of right lobe and part of left lobe.	Two days after operation pulse 100–120. Sleeps well.	Six years and seven months after operation, pulse 70–80. Exophthalmos scarcely observable.
153.	do. Case 4.	Primary. Parenchymatous goitre.	Gas and ether. Removal of the left lobe.	Pulse fell to 90 on the second day.	Five years and nine months after operation, exophthalmos gone. Nervousness and tremor have disappeared; in good health and strength.
154.	do. Case 5.	Secondary. Cystic colloid goitre.	Removal of left lobe, isthmus and middle lobe.	Pulse remains at 90; nervousness and tremor disappearing.	Three years and ten months after operation, patient well.
155.	do. Case 6.	Pulse 120. Male. Compression of trachea and esophagus by the growth. Bilateral thyroidal enlargement, with substernal prolongation. Acute parenchymatous goitre. Acute thyroidism.	Gas and ether. Removal of both lobes was necessitated because of the substernal character of the growth. collapse of the patient during operation.	Great restlessness; temperature rose to 106; pulse 172, 160, 140, 108; respirations 42, 28, 32. Continued for three days.	3 years and 8 months after operation, pulse 90, exophthalmos still noticeable; attending to his work.
156.	do. Case 7.	Secondary. Tachycardia. temperature 100 F.; pulse 124. Female. Right lobe and isthmus greatly enlarged, increased colloid material. Adenomatous goitre.	Gas, ether and morphia. Removal of right lateral lobe.	Temperature 99 to 103 F.; pulse 155 to 80. Symptoms gradually abated.	3¾ years after operation exophthalmos very slight; nervousness and tachycardia gone; pulse normal.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
157.	Frank Hartley. Annals of Surgery, Phil., 1905, vol. xlii, p. 33. Case 8.	Right side of neck markedly enlarged; eyes prominent; palpitation; pulse 130; temperature 99 F.; respiration 30; excessive nervousness; enlarged right lobe and isthmus. Male. Adenomatous enlargement of isthmus and right lobe.	Gas and ether. Removal of right lobe and isthmus.	Temperature 103 F.; pulse 132; respiration 28; tachycardia and nervousness disappear.	3¾ years after operation, tachycardia present, but nervousness and exophthalmos gone.
158.	do. Case 9.	Marked exophthalmos; general tremor; tachycardia 116–124; nervous. Bilateral thyroid enlargement, soft and vascular variety. Dysphagia. Female. Simple vascular adenomatous enlargement of the left lobe of thyroid.	Gas and ether. During operation patient suddenly became cyanotic. Respiration and pulse stopped simultaneously.	Death "during extirpation of the left lobe, the patient suddenly became cyanotic. Respiration and pulse stopped at the same time. No efforts at resuscitation availed."	
159.	do.	Bilateral adenomatous thyroid enlargement, very vascular.	Gas, ether and morphia. Removal of both lobes, leaving enlarged middle lobe and small part of one lateral lobe with superior thyroid artery and vine to preserve nutrition.	Second day restlessness and tremor diminished. Pulse 90, temperature 100; fourth day pulse 80, temperature 99 F.	2½ years after operation exophthalmos almost gone. Tachycardia, nervousness and tremor gone.
160.	do.	Typical parenchymatous goitre, little colloid, stroma moderate in amount, fibrous and infiltrated with small round cells.	Gas and ether preceded by atrophine sulphate 1/100, changed to chloroform. 1½ lobes removed. Upper ¼ of one lobe preserved with its circulation intact.	Temperature 99 to 102 F. Pulse 120 and 80. Respiration 20–24. Nervousness and tachycardia begin to disappear; tremor less quickly, exophthalmos not at all.	2½ years after operation slight exophthalmos; all other symptoms gone. First seven months patient presented signs of cachexia thyreopriva; but these disappeared in next six months.
161.	do.	A pure parenchymatous goitre.	Gas, ether and morphia. Left lobe and part of right removed.	Temperature and pulse normal after operation. Exophthalmos less in right than in left eye.	3 months after operation, good health, gained 15 pounds. Nervousness and exophthalmos much diminished. Pulse 80.
162.	do.	Right lobe 11cm x 5cm x 5cm; middle lobe 6cm x 4cm x 2cm. Moderate enlargement of alveoli, filled with colloid and moderate amount of blood pigment. Stroma very vascular. Colloid parenchymatous goitre.	Gas, ether and morphia. Removal of right and middle lobes. Ligation of superior thyroid artery and vein on left side.	Temperature 104 to 99 F. Pulse 130 to 90. Slight thyroidism and bronchopneumonia. Slight degree of acute thyroidism. All symptoms disappeared by the fourteenth day.	"Best of health" two months after operation. Exophthalmos, still slight but no stare, and can close lids in all positions. Works daily.
163.	do.	Vascular adenomatous thyroid.	Gas, ether and morphia. Hemithyroidectomy with ligature of superior thyroid artery and vein of remaining lobe.	No temperature; restlessness reduced.	Three months later, exophthalmos diminished. Tachycardia and nervousness gone. "Health perfect."
164.	do.	Vascular and colloid goitre.	Hemithyroidectomy with ligature of the superior thyroid artery and vein of opposite lobe.	No temperature. Tremor lessened. Pulse 90–110.	One month later tachycardia and nervousness gone. Exophthalmous diminished. "Health perfect."
165-173.	Ehrich, Beitrage. zur klin. Chir., 1900, vol. xxviii, p. 126. Case 1. Operator, Garrè.	Primary. Tachycardia.	Resection of right lobe. Drainage.		7 years after. Pulse 90. Much improved, but still some symptoms.
166.	do. Case 2. Male.		Ether anesthesia for skin incision; balance of operation without anesthesia. Resection of right half. Much hemorrhage. Drainage.	No improvement for nine months after operation.	Four years later pulse 80. Almost well.
167.	do. Case 3.	Pulse 120.	Chloroform. Removed left half of struma; ligated number of vessels, tied arteries.	1½ years later patient's condition satisfactory.	3 years after operation, recurrence.
168.	do. Case 4. Operator, Garrè.	Primary.	Morphine, ether. Removal of left half of struma. 1½ years later ligated left superior thyroid artery.	Slow improvement.	2½ years after, pulse 72.
169.	do. Case 5. Operator, Garrè.		Resection of left cervical sympathetic. Later resection of right cervical ganglion.		Not much improved.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
170.	Ehrich, Beiträge. zur klin. Chir., 1900, vol. xxviii, p. 126. Case 6. Operator, Garrè.	Primary.	Morphine. Extirpation of right half of struma.	Had some local infection.	2½ years later, nutrition good, but occasionally tremor and tachycardia.
171.	do. Case 7. Operator, Garrè.	Primary.	Morphine, ether. Extirpation of right half of struma.	5 months after, exophthalmos unchanged; all other symptoms improved.	Partial recovery.
172.	do. Case 8.	Secondary. Pulse 120.	Removal of left half of gland.		2 years later, perfect recovery.
173.	do. Case 9.	19 years. Pulse 130.	Partial resection of struma.	Improved. Pulse 78.	Complete cure.
174.	Ballin, Max. Detroit Med. Jr., 1903–4, vol iii, p. 241.	Secondary.	Chloroform. Enucleation of goitre.	Recovery.	Recovery.
175.	do.	Primary.	Schleich's anesthesia. Resection of left lobe.	Recovery.	Complete cure.
176.	do.	Primary.	Cocaine anesthesia. Resection of right side of thyroid gland.	Recovery.	Good result.
178.	Edmunds. Lancet., London, 1901, vol.— p. 453. Case 1.	Primary.	Removal of right lobe of thyroid gland.	Recovery.	The patient got much better and all the symptoms were greatly relieved, but 8 years after the operation there were still symptoms of the disease.
179.	do. Case 2.	Secondary. Adenoma, on microscopic examination the adenoma was seen to have undergone hypertrophic changes. Symptoms did not yield to medical treatment.	Removal of adenoma.	Recovery.	Complete disappearance of symptoms.
180.	McBurney. Jour. Mental and Nervous Diseases, 1894, vol. xxi, p. 492	Primary. Condition had lasted three years.	Right lobe of thyroid was removed.	Marked improvement.	One year after operation, no exophthalmos, no nervous symptoms. Pulse 100, was 140 before operation.
181.	Harry. Deut. medicinische Wochenschr., 1903, vol. xix, p. 245.		Removed nearly all of gland. Details of operation not given.	Death.	
182.	Warren. Rep. by Putnam. Jour. of Mental and Nervous Diseases, 1893, p. 801.	Primary. Medical treatment had been used to no avail. Electrical treatment also had failed to obtain results.	Ether anesthesia. Mucus had to be swabbed out of throat. Right lobe of thyroid gland was shelled out with the finger, cut off after ligature of the isthmus.	"Sharp post-operative fever could not be explained by any septic condition of the wound." Pulse 185, temperature 104 F. "Paralysis of muscles supplied by recurrent nerve. This still persists and the voice is feeble, but clear and articulate."	Seen one year after, patient considered herself better. Her appearance is more natural; she is less agitated. There is improvement, but no cure.
183.	Determeyer. Operated on by Rotter, Deut. Med. Wochenschr., 1893. No. 11, vol. xix, p. 260.	Primary. Patient in serious condition. All symptoms present marked. Emaciation.	Largest half of struma removed.	Recovery.	All symptoms disappeared. Great improvement outside of exophthalmos which persisted though diminished.
184.	Kümmell. Deutsche Med. Wochenschr., 1890, vol. xvi, p. 438.	Secondary. Compression of trachea. Medical treatment without avail.	Removal of right lobe in toto, and of left lobe partially.	Recovery.	Six weeks after operation all symptoms had abated. Pulse was 70–80.
185.	Témoin (Bourges). Revue de Chirurgie, Paris, vol. xviii, 1898, p. 1100.	Primary. Disease was of seven years' duration. Was progressive.	Resection of right lobe and hypertrophied median lobe.	Recovery.	Four years after exophthalmos had completely disappeared. There was no tremor; no palpitation.
186.	do.	Primary. Had had to abandon her work. (School teacher).	Partial thyroidectomy.	Recovery.	Four years after was still in perfect health.
187.	Hahn, Berliner Klin. Wochenschr., 1888, vol. xxv, p. 845. Reported by Frank.	Primary.	Total extirpation of thyroid gland, which weighed 110 grammes. At operation it was seen that the trachea was scabbard-shaped and somewhat softened.	Died of pneumonia. Left recurrent nerve had been included in a ligature.	

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
188.	Hahn. Berliner klin. Wochenschr., 1888, vol. xxv. p. 845. Rep. by Frank.	Secondary.	Total extirpation of thyroid gland. 410 grammes.	Recovery.	Five months after no dyspnea, no palpitation, all nervous symptoms disappeared.
189.	do.	Primary.	Resection of right lobe. Operation made on account of dyspnea.	Recovery.	Five months after operation, exophthalmos and tachycardia still present.
190.	do.	Secondary.	Intraglandular enucleation, according to Socin-Garre's method. Profuse hemorrhage.	Recovery. Dyspnea disappeared.	One year later in good health. Breathing easy.
191.	Friedheim. Arch. f. klin. Chir., 1905, vol. lxxvii, p. 917, says that at present surgery is the only known cure for disease Morbus Basedowii. Case 1. Girl.	Exoph. struma. Pulse 148-180, tremor etc.	Cures. ½ gland removed.	Six weeks after symptoms disappearing. Pulse 68.	Cured.
192.	do. Case 2. Girl, 20 years.	Exoph. struma. pulse 180.	½ struma removed.	Four weeks after, all subjective symptoms gone.	11 years after, perfectly well.
193.	do. Case 3. Woman, 45 years.	3 years' standing exoph. struma. Pulse 130.	Partial extirpation, ½ of struma removed.	14 days later symptoms disappearing.	11 years after, pulse 92, symptoms gone.
194.	do. Case 4. Woman, 31 years.	Exoph. struma. Pulse 100-130. Emaciated.	Left half of gland and part of right removed.		10½ years after, perfectly well. Pulse 68. No symptoms.
195.	do. Case 5. Woman, 40 years.	Secondary. Exoph. struma. Pulse 140. Tremor.	One half gland removed.		1 year after, perfectly well. Pulse 70.
196.	do. Case 6. Woman, 38 years.	Exoph. struma. Pulse 130.	All vessels were ligated. Nodules enucleated, leaving a small portion of gland.		Ten years after, recovery maintained. Pulse 72.
197.	do. Case 7. Girl, 17 years.	Exoph. goitre. Pulse 140. Tremor.	Partial strumectomy.	14 days afterward, symptoms began to disappear.	Five years afterward, fully recovered.
198.	do. Case 8. Woman, 44 years.	Exoph. goitre. Tremor. Pulse 130.	Partial thyroidectomy.		Ex. 9½ years after operation, recovery complete. Pulse 88.
199.	do. Case 9. Girl, 15 years.	Emaciated. Exoph. considerable. Struma. Pulse 135. Tremor.	Enucleation of right half of gland and process extending to sternum.		9½ years after operation, recovery complete. Pulse 80.
200.	do. Case 10. Woman, 40 years.	Exoph. struma. Pulse 120.	An apple-sized right-sided nodule enucleated.	Four weeks after, improved.	4½ years after, perfectly well. Pulse 65-70.
201.	do. Case 11. Man, 42 years. School teacher.	Exoph. struma. Tremor. Pulse 140.	Removed enlarged right half of gland. Six months after, extirpated left half of gland, leaving isthmus.	Slight improvement.	8 years afterward, perfectly well. Pulse 88.
202.	do. Case 12. Girl, 18 years.	Exoph. struma. Pulse 140; palpitation and tremor. Cachectic.	Removed whole of right side of struma close to isthmus.		8 years after, in perfect health. Pulse 90.
203.	do. Case 13. Girl, 17 years.	Exoph. goitre. Pulse 160. Treated with thyroid tablets which made patient worse.	Removed right lobe of thyroid, after having tied on same side sup. and inf. thyroid arteries.		7 years after, perfectly well.
204.	do. Case 14. Woman, 26 years.	Exoph. struma. Pulse 120.	Removed right half of gland. Enucleation.	Very marked improvement.	6 years after, perfectly well Pulse 90.
205.	do. Case 15. Girl, 15 years.	Exoph. struma. Left side paralysis of vocal cord. Pulse 140.	Removed from thyroid gland a nodule like a hen's egg, and a part of right thyroid gland.		5 years afterward improved. Pulse 100. Exophthalmos still present. Tremor gone. General condition much improved.

No	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
206.	Friedheim. Arch. f. klin. Chir., 1905, vol. lxxvii. p. 917, says that at present surgery is the only known cure for disease Morbus Basedowii. Case 16. Woman, 40 years.	Exoph. struma. Pulse 140.	Removed a mass size of goose egg. Was enucleated from right lobe of thyroid.		1 year after, pulse 85; no nervous symptoms, but exophthalmos. 9 years afterward, no recurrence.
207.	do. Case 17. Female, 21 years.	Exoph. goitre. Pulse 170. Tremor.	Enucleated a mass apple-sized from right lobe.		2 years after, perfectly well. 11 years after operation, some Basedow's symptoms reappeared; G. Ex. Pulse 140. Tremor. She was able to attend to her duties as farm hand.
208.	do. Case 18. Woman, 26 years.	Exoph. struma. Pulse 130. Tremor.	Enucleation of apple-sized nodule from right lobe.	She improved, but afterward all symptoms recurred.	2 years after, removed a large portion of left lobe. Pulse went down to 90. She felt better for 2½ years after last operation. The remaining part of T. gland enlarged and Basedow's sym. rec.*
209.	do. Case 19. Woman, 20 years.	Exoph. struma. Pulse 134.	Removed right thyroid lobe.		2½ years after, absolutely well. 8 years afterward, some return of symptoms. No exophthalmos. Pulse 90, but complains of palpitation.
210.	do. Case 20. Woman, 22 years.	Exoph. struma. Pulse 130. T.	First operation. Extirpated right half of struma. Second operation. Then removed left lobe, leaving isthmus.	Improved, but all old symptoms recurred.	Left lobe began to increase in size. After that got tetany; gave thyroid tablets; ten days after, died.
211.	Cassius Rogers, M. D., Chicago Woman. Operated at Frances E. Willard Hospital, 1907.	Primary. Used thyroidectin for about a year, no results. Caused dyspnea by compression.	Ether. Removed all of thyroid gland except mass about size of distal phalanx of thumb.		Recovery. All symptoms disappeared.
212-261.	†Schultze, Kurt. Mitteilung a. d. Grenzgebiete der Med. und der Chirur. Jena. 1906. Sechzehnter Band, p. 161. 50 cases.		Local anesthesia 28 cases. General anesthesia, preceded by morphine, 11 cases. Partial thyroidectomy.	36 cures. 6 much improved. 1 without result. 7 deaths. 1 death occurred three weeks after operation, due to broncho-pneumonia. All the other deaths occurred in patients in whom bad cardiac conditions were present.	Kurt Schultze gives the following tabulated results: Cured, — Moderate severity 100 per cent. Mod. bad cases cured 66 per cent. Improved 14.2. No results 5.1. Deaths, 5.7. Bad cases cured, 57 per cent. Improved 7. 7. No results 5.7. Deaths, 28.5.
261-371.	‡Kocher (Berne) Switzerland. Corresp. Bl. und Schw. Aerzte, 1904, vol. xxxiv, p. 503, and other sources.		3 cases, unilateral resection and partial resection of opposite lobe, with ligature of arteries. 3 cases at one sitting. Ligation of arteries and resection of sympathetic.		1 death. 1 cure. 1 cachexia strumipriva. 1 much improved. 1 slightly improved. 1 death.
	A. Kocher, Berne, Switzerland. 111 cases; 59 reported in detail. In the J. A. M. A., 1907, vol. xlix. p. 1240, Albert Kocher states that his father has operated on 254 exophthalmic goitre patients. The mortality was 3.5%.		14 unilateral resection. Ligature of arteries 16 times (3 vessels at one sitting). In one case the superior thyroids were ligated at one sitting, and one inferior thyroid artery at another sitting. 19 cases of ligature of vessels of one side, and unilateral excision of opposite side. 10 times in one sitting; 8 times in two sittings, and once in three sittings. 4 cases, ligature at one sitting. Unilateral excision and partial resection opposite lobe. 1 case, ligature in two sittings. Ligation of arteries and partial resection.	11 cures, 2 marked improvement. 13 cures, 1 marked improvement. 1 tetany, 1 death. In one case he ligated the 4 vessels and the patient developed tetany, which lasted one year, then recurred often. 17 cures, 2 much improved.	Gross results of 59 cases reported in detail: 45 cured. 8 improved, 2 slightly improved, 4 died. In last 52 cases only one death; detailed results not given. 3 cured, 1 death. 1 cure.

*Would not submit to another operation. Seven years after operation is still markedly improved.

†He has had some of his patients under observation 5, 9, 10 and 18 years. In 40 cases, he took out one lobe and a large portion of the other lobe, leaving just enough gland tissue to carry on function. In 10 cases, he removed one lobe preceding or following that procedure by ligation of the arteries on the same or opposite side.

‡In the transactions of the German Society of Surgery, 35th Congress, Berlin, April 4–7, 1906, part II, p. 24, Kocher reports 52 cases of Basedow's disease. He does not give his results as to recovery from the disease. Only one of these patients died. In this case there was postoperative bleeding, which necessitated re-opening of the wound. The patient died from the shock of the secondary operation.

Kocher does not ligate the four main arteries as a routine procedure, as he fears cachexia strumipriva.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
373.	Jossipovici. Deutsche Med. Wochenschrift, 1892. vol. xviii, p. 91.	Primary.	Removal of right half of thyroid gland.	Recovery.	Improved.
373 a.	do.	Primary.	Partial thyroidectomy.	Recovery.	Marked improvement.
374.	Huntington, Thos. W. San Fran., Cal. Trans. of the Am. Surg. Assoc. 1905, vol. xxiii, p. 154. Case 1.	Secondary.	Right lobe removed.	Resumed work at end of three months.	3½ years after, all symptoms were corrected. Patient was well.
375.	do. Case 2. 40 years.	Primary.	Left lobe removed.	Recovery.	Three years after patient said health was ideal.
376.	do. Case 3. Male, 56 years.	Secondary. Patient's condition was deplorable. Long pressure on the trachea rendered dyspnea persistent.	Left lobe removed.	Recovery, but relief from symptoms was somewhat delayed.	Three years after, symptoms were still greatly ameliorated. No classical Basedow's symptoms were present.
377.	do. Case 4. 53 years.	Secondary. Basedow's symptoms had developed during last two years. Condition very serious.	Entire left and three-fourths of right lobe removed.	Recovery.	Three years after exophthalmos had disappeared. Respiration and pulse normal. Entire absence of psychic symptoms.
378.	do. Case 5. 42 years.	Secondary.	1st operation. Enucleation of right lobe. Six weeks later, two thirds of left lobe removed.	After first two operations relief from symptoms was slow, but continuous.	She continued to earn her living comfortably to March 10, 1905, when she again presented herself for treatment. There had been for the last 2 months a marked increase in the remaining portion of the left lobe, and a recurrence of Basedow's symptoms, with a general failure in health. At patient's request the greater portion of the remaining thyroid structure was removed. This was followed by an immediate improvement of symptoms.
379.	do. Case 6. 32 years.	Secondary. Exaggerated Basedow's symptoms. Before operation patient was extremely nervous, cried most of the time and without provocation. "Heart greatly dilated;" "excessive thirst;" "frequent vomiting."	Removed the entire left lobe.	Immediately following the operation she became uncontrollably nervous, which was relieved by morphine.	2 years after has resumed her former occupation. No recurrence of former symptoms. Her condition is satisfactory in every sense.
380.	do. Case 7. 30 years.	Primary.	Whole of right and three-fourths of left lobe removed.	Recovery.	A year after all symptoms had disappeared.
381.	do. Case 8. Male, 51 years.	Primary. Difficulty in swallowing.	Removed left lobe of thyroid gland.	Recovery.	One year after, patient had no symptoms suggestive of Basedow's disease.
382	do. Case 9. 48 years.	Primary. Polyuria. "Slight interference with deglutition."		Recovery.	Death from acute thyroidism which developed on 6th day after operation and died in 12 days after operation.
383.	James March Jackson, M.D., Boston. Med. and Surg. Jr., vol. cl, No. 7, 1904. Operated on by Mickulicz.		Removal of left lobe and ligation of superior and inferior thyroid arteries of right lobe.	Recovery.	6 months after, patient's condition was much improved.
384.	J. G. Witherspoon, St. Louis. Jour. of A. M. A., 1903, vol. xli, p. 228.	Secondary.	Right lobe removed under local anesthesia.	Recovery. Improved.	A year after condition was quite normal.
385.	do.	Primary.	Removed right thyroid lobe.	Recovery.	Patient lost from observation.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
386.	J. G. Witherspoon, St. Louis. Jour. of A. M. A., 1903, vol. xli, p. 228.	Primary.	Right lobe removed under local anesthesia. "Right thyroid lobe was the larger,"—"It had grown downward into the chest behind the sternum, and was adherent to the trachea for a short interval."	Recovery. Marked improvement.	Several months after, patient was seen, she had gained in flesh and felt well.
387-497.	*C. H. Mayo. Jour. A. M. A., 1907, vol. xlviii, p. 273. 110 cases.	The same operator has operated on 100 additional cases since with increasingly felicitous results.			
498.	Krönlein, Berliner klinische Wochenschrift, 1895, vol. xxxii, p. 421. 8 cases.	These cases were not reported in detail.	Partial thyroidectomy.	Recovery.	Cured.
499-515.	Shepherd, Francis J. J. Am. M. Ass., Chicago, 1906, vol. xlvii, p. 607. Case 1.	Secondary. Patient had been forced to give up her occupation on account of nervousness. Had a difficulty in breathing.	Removal of left lobe of gland.	Recovery. Patient returned to work.	Recurrence several years later. Patient declined operation.
	do. Case 2.	Marked case. Great difficulty in breathing on exertion.	Enucleation from each lobe of mass size of orange.	Recovery.	No recurrence. Seen ten years after, patient had no symptoms of Grave's disease and was perfectly well.
	do. Case 3.	Secondary.	Hemithyroidectomy.	Recovery.	No recurrence. Five years after patient is still quite well.
	do. Case 4.		All thyroid body removed except isthmus.	Recovery.	No recurrence. Four years later was stout, healthy. No nervous symptoms.
	do. Case 5.	Cystico-colloid goitre.	Enucleation of tumor.	Recovery.	No recurrence. Slight exophthalmos persisted.
	do. Case 6.		Partial thyroidectomy.	For a time no improvement in symptoms.	Six years after patient was very well. Slight exophthalmos persisted.
	do. Case 7.		Hemithyroidectomy.	Recovery. Pulse soon came down to 90.	Unable to trace patient.
	do. Case 8.	Secondary.	Hemithyroidectomy. Right half of thyroid body and isthmus removed.	Recovery. Symptoms of acute thyroidism after operation. Subsided in about a week.	Recovery maintained. Pulse 70-80. Patient gained in weight.
	do. Case 9.	Secondary.	Hemithyroidectomy. Trachea was displaced to the left.	Recovery. Symptoms of acute thyroidism developed and lasted about a week.	No recurrence.
	do. Case 10.	Paralysis of left vocal cord. Growth was a very large one. Secondary.	Whole gland was removed with exception of small part of right lobe over trachea.	Recovery very slow.	No recurrence. No signs of myxaedema.
	do. Case 11.		Total thyroidectomy. Ether anesthesia.	Died next morning from acute thyroidism.	
	do. Case 12.	Very grave case.	Right lobe and isthmus removed.	After operation became quite maniacal; died during the night.	In this case, the parathyroid had also been removed, and on examination was found to be normal.
	do. Case 13.		Removal of right lobe and of isthmus.	Some symptoms of thyroidism after operation. At first no improvement, but a year later she said she was better than she had been for years.	No recurrence. Left half of goitre had diminished considerably in size.

*Of those who survived the operation, 50 per cent made an early recovery; in 25 per cent it took several months to improve from the main symptoms; and 25 per cent, while greatly improved, have occasional temporary relapses of the tachycardia and tremor.

Nine deaths in all, but only two deaths in the last 64 cases.

They (Mayo Brothers) use a collar or transverse incision. In tumors of medium size, the incision crosses the center of the tumor; in larger tumors, it crosses the upper third, and the lower flap is split vertically to the sternum if necessary. Should there be a large area of cut gland exposed, it is burned over with carbolic acid followed by alcohol. Drainage is employed. Ether is the anesthetic they chiefly use. Great stress is laid upon the wisdom of saving the posterior fibrous capsule of the thyroid gland. This lessens the liability to injury of the recurrent laryngeal nerve and to removal of the parathyroid bodies. The different publications of the Mayos can be consulted with great benefit. They state that "no patient should be operated upon whose pulse can not be counted continuously because of uneven tension. Gastric crises and diarrhea should also lead to postponement. Ascites and aedema of feet and hands are contraindications. All of the foregoing contraindications may by suitable treatment be overcome." Mayo, C. H., Illinois Medical Journal, 1907, vol. xii, p. 327.

No.	Operator's Name Date of Operation Reference	Variety	Operation	Immediate Results	Late Results
	Shepherd, Francis J. J. Am. M. Ass., Chicago, 1906, vol. xlvii, p. 667. Case 14.		Left lobe and isthmus removed. The former contained an adenomatous growth.	Recovery.	No recurrence. Slight exophthalmos persisted.
	do. Case 15.	Patient 19 years old.		Death. Autopsy showed greatly enlarged thymus and excessive enlargement of both suprarenals.	
	do. Case 16.	Voice was affected. Had difficulty in swallowing. Periods of mental depression.	Right half of thyroid removed.	Recovery. Great improvement.	No recurrence.
	do. Case 17.		Excision of right lobe under cocaine anesthesia.	Recovery rapid.	No recurrence.
516.	George Everett Beilby.[1] Annals of Surgery, 1906, vol. xliii, p. 807. Exophthalmic goitre. Case 1.	Primary. Onset one year ago.	Both right and left lobes removed. Ether anesthesia.	Death, acute thyroidism.	Microscopic examination shows typical exophthalmic hypertrophic changes in goitre.
517.	do. Case 2.	Primary. Marked case. Patient grew worse under medical treatment.	Ether anesthesia. Removed half of right lobe and isthmus.	Patient died on table.	
518.	do. Case 3.	Secondary. Simple hypertrophy and also a minute encapsulated adenoma.	Ether. Removed half of left lobe and isthmus.	Recovery.	No recurrence.
519.	Hecht, D. O. Chicago.	Apex-beat at the nipple line. Loud systolic murmur over base at second and third intercostal space, loudest near the left border of the sternum; tachycardia 140. Intractable diarrhea, sweating, poor appetite, insomnia, weight about 103 lbs. Therapy of bromides, sodium salicylate, thyroidection without avail.	Operated Nov. 12, 1906, under local scopolamin anesthesia, operator Dr. Emil Ries. Right lobe extirpated.	Wound healed slowly, because of considerablle coloid secretion at one angle. Marked rise in temperature to 105° (resorption). Cough and marked cardiac symptoms. After first week marked improvement. Patient presented at the Chicago Medical Society January 30, 1907. Slight recession of exophthalmos, marked improvement in cardiac action, systolic bruit disappearing, tachycardia ranging from 80 to 96.	Marked improvement in all of the accessory symptoms, tremor persists, appetite good, sleep good, increase in weight since the operation from 103 to 124½ lbs. June 1st, 1907, constant improvement. Weight 135 lbs. Subjective symptoms, hardly any. Objective, greatly improved.

[1] Three more cases were either entirely cured or greatly benefited by the operation. One case, seen 4 years after operation, is well. One, 14 months after operation, is well. One, 10 months after operation, is well.

HYPEREMIA IN THE TREATMENT OF TUBERCULOSIS OF THE PERITONEUM

By ARTHUR E. HERTZLER, M. D., Kansas City, Mo.

THE researches which are the basis of this paper were carried on some six or eight years ago and were at that time regarded as of physiological interest merely. They were begun before the appearance of Fenger's last paper on the Treatment of Tuberculous Peritonitis and were repeated and extended after the appearance of that paper. In that paper, it will be remembered, he questioned the use of abdominal section in this disease, which statement discouraged me from publishing the observations at that time. Since, however, the treatment of various inflammatory diseases by hyperemia has proven of use in other situations, I now venture a report.

Theoretically, the normal intra-abdominal pressure may be said to be equal to the pressure of the elasticity of the abdominal walls. In ordinary respiration the diaphragm is perhaps the chief factor in the production of the negative intrathoracic pressure. This intrathoracic pressure is equal to about 5 mm. of mercury. The downward pressure of the diaphragm is partly resisted by the pressure of the abdominal wall. Attempts to measure this resistance have not been productive of harmonious results, but I believe it safe to say that the intra-abdominal pressure is as much positive as the intrathoracic pressure is negative. In forced expiration the pressure within the thorax may be more than 100 mm. of mercury. A large proportion of this expiratory force is exerted by the abdominal muscles. It is easy to establish, experimentally, that contraction of the abdominal muscles may raise the abdominal pressure to a very high point, and that the pressure is practically nil when an animal is under deep anesthesia. (Likewise after tapping an ascites.) When the abdomen of a normal animal is opened, the vessels dilate, because the intra-abdominal pressure is removed. This was proven in two ways. Abdomens of small animals (mice, young rats, and guinea-pigs) were opened and the vessels allowed to dilate ad maximum (about 15 minutes). The animals were then placed with abdomens still open under a bell-jar and air forced in, which by increasing the atmospheric pressure caused the vessels to become smaller. Better still is the second method. A glass window is sewed into the belly-wall of an animal, as previously described by me (Peritoneal Adhesions: Their Cause and Prevention. Trans. Western Surg. and Gynecol. Assn., 1904), and a silver tube is tightly sewed into the abdominal wall at the median line. The tube must be held in place by the pressure of the fascial suture. The flange must rest snugly against the peritoneum, but pressure sufficient to cause a degenerative reaction must be avoided. If these precautions are observed, adhesions do not occur. These operations cause a dilatation of the vessels which remains for some time, as seen through the window. After a time the equilibrium is regained, and the vessels resume their normal size. If now the tube is opened and air allowed to enter, a new dilatation occurs. Care is necessary in carrying out the latter experiments, or negative results will be obtained, because muscular relaxation is necessary in order to obtain a dilatation, for, if the animal is excited, the voluntary use of the abdominal muscles will increase the tension rather than lessen it, as may be observed through the glass window.

At that time a number of experiments were made on the treatment of experimental tuberculosis, and it seemed that the disease was retarded by the treatment. However, the personal equation in such researches is so difficult to estimate, and the inherent difficulties in this class of researches are so hard to overcome, that I would hesitate to say positively that such was the case. These difficulties are increased because of the variable course of the disease in animals and the necessary element in shock and disturbed nutrition attending the experiments.

In view of these facts I do not feel warranted in going beyond the following statements.

1. The result of opening the abdomen is a hyperemia of the peritoneum and subperitoneal tissues, due to the lessening of pressure from without. (I am not unmindful of the fact that the removal of the peritoneal fluid by any means will lessen the intra-abdominal pressure, followed as it is by a very flaccid state of the abdominal muscles for a few hours, and permitting in this way the dilatation of the vessels. The collection of fluid within the peritoneal cavity, as a result of any disease, increases markedly the intra-abdominal pressure, and in this way may produce an anemia of the peritoneum with attendant metabolic embarrassments.)

2. Hyperemia has been found of use in tuberculosis elsewhere, and by analogy we may be warranted in assuming the same factor as active in the treatment of tuberculosis in the peritoneum. With these two facts in mind, it seems to me quite possible that this is the factor underlying improvement by opening the abdomen in some forms of peritoneal tuberculosis. This assumption finds a clinical support in the fact that it is only the type with exudation that is so benefited. This is easily explained on this theory, for manifestly in the hyperplastic types the vessels cannot dilate to any considerable extent, therefore the operation can be of no use.

If this is the correct view, the benefit obtained from a single treatment would be much enhanced by a repetition of it. This can be obtained by leaving a silver tube (silver discourages adhesions more than any other metal) with a flange within the peritoneal cavity, so that air may be admitted into the abdominal cavity, with an attending hyperemia, at intervals — just as in animal experimentation. By this means repeated engorgements can be obtained, just as in the case of treatment of joints without the danger or inconvenience of repeated laparotomies. The danger attending such a procedure is, of course, dependent entirely upon the skill of the operator. The period of time during which such a wound could be kept aseptic, would be of course theoretically indefinite. Practically, it would depend entirely upon circumstances. The promptness with which the wound heals after the removal of the tube and the likelihood of hernia following would depend entirely upon the time the tube remained in position. It is necessary to know, of course, that the tube ends into the free abdominal cavity and not into a bunch of adhesions. With care and the use of a silver tube with a flange which terminates just below the parietal peritoneum, let it be repeated, this end can be obtained without trouble.

In conclusion I may say that primarily my purpose has been to suggest a surgical principle rather than to present a method of treatment. The enormous difficulties encountered when dealing with intra-abdominal mechanics has impressed all who have attacked the problem in a scientific way. This fact has made me prefer to express my ideas in general terms rather than attempt to present a definite statement of data, in a field where experimental results are so variable.

STOVAINE SPINAL ANESTHESIA

A Further Report from Various Clinics with a Study of Over 5,500 Cases Collected from the Literature

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STOVAINE is made synthetically and was discovered in 1904 by Dr. Fourneau, a French chemist, in the chemical laboratory of the University of Berlin. He found that it was related to eucaine and cocaine in that they had two atoms in common. It was studied from a physiological standpoint by Billon of Paris; and Chaput was the first one to use it as a spinal anesthetic.

The *Journal of the American Medical Association* of December 1, 1906, gives the following description of stovaine (Benzoyl-Ethyl-Dimethylaminopropanol Hydrochloride): "It is prepared by causing a reaction of benzoyl chlorid on the a-dimethyl-amino-pentonal-b, which is itself the product of reaction of ethyl-magnesium chlorid on methylamino-acetone. It crystalizes in small, brilliant scales, which melt at 175C. (347F.) It is extremely soluble in water and easily in methyl alcohol and acetic ether, but requires five parts of absolute alcohol for solution and is only slightly soluble in acetone.

It is quite stable and its solutions may be sterilized at 115C. (239F.) without suffering decomposition.

The aqueous solution is slightly acid to litmus, neutral to methyl orange. It is precipitated by all the alkaloidal reagents and is decomposed by even very dilute alkalies.

It is incompatible with alkalies and all alkaloidal reagents.

Actions and Uses. Stovaine acts as a local anesthetic of about the same power as cocaine, but dilates the blood vessels, whereas cocaine contracts them and exerts a tonic action on the heart. It is only one-third to one-half as toxic as cocaine.

It is used as a local anesthetic; while most reports are favorable, one case of gangrene has been reported following the use of a 10 per cent solution.

Dosage. Internally, 0.002 Gm. ($\frac{1}{30}$ Gr.) as pill. Locally it may be used in the eye in a 4 per cent solution, and applied to other mucous membranes, as in laryngology, in from 5 to 10 per cent solutions. In hypodermic injections for local anesthesia it can be used in from 0.75 to 1 per cent solution.

It has some antiseptic action (Babcock)."

INVESTIGATION

Having seen stovaine in use in a great many places while in Europe last fall, and wishing to investigate it further, I sent the following list of questions to a number of surgeons in this country and in Europe:

In how many cases have you used stovaine?

What preparation do you use? Billon's? Merck's? Riedel's?

Have you had any deaths from stovaine? How many?

In how many cases have you failed to produce anesthesia?

Does age influence the anesthesia?

Do your patients suffer shock from being conscious during the operation?

Is there any less bleeding from the wound than with a general anesthesia?

Do you get good relaxation of the muscles?

Have you operated upon the liver or stomach with spinal anesthesia?

Do you use scopolamin and morphine in these cases?

During Operation

How long does the anesthesia last on an average?

Is there complete muscular paralysis?

Is the heart affected?

Does it affect respiration?

Is the pulse affected?

Have your cases had nausea during the operation?

Do you use the Trendelenburg position in spinal anesthesia?

If any bad symptoms have supervened, what treatment have you used?

After Operation

Do your patients suffer from headache?

Have you noticed paralysis of any muscles?

Has there been a postoperative rise of temperature?

Have any of the following organs been affected, viz., heart, lungs, liver, or kidneys?

Have you noticed any peculiar color of the skin?

Have you made any observations on the blood of these patients?

The following is an epitome of the answers received.

VonRosthorn has used stovaine 107 times in the Heidelberg Frauenklinik without a death. He has failed to produce anesthesia in 13 per cent of his cases and considers youth and old age as contraindications for its use. There has been no shock from the patients' being conscious during operation. Muscular relaxation "excellent." He always uses scopolamin and morphine. Anesthesia averages an hour in length. Respirations have been somewhat affected in two cases only. "Very few" cases have been nauseated during operation. The Trendelenburg position is used. About 34 per cent of the cases have some headache after operation. He has not had any muscular paralysis following operation. In some cases there has been a postoperative rise of temperature, and a few cases have shown some icterus. No observations have been made on the blood.

Dr. Paul Roeder reports for Prof. Israel, in his absence, that they have used stovaine in 91 cases without mortality; they use Billon's preparation. He has failed to produce anesthesia in only three cases. They experienced no shock from being conscious. He does not use scopolamin and morphine. The anesthesia lasts an hour. He uses the Trendelenburg position. Some cases are nauseated during operation, but there have been no heart or respiratory complications. In some instances there is postoperative headache. No observations have been made on the blood. Three cases have shown temporary involvement of the 6th nerve.

Prof. Henkel of Berlin writes that they have had no experience with spinal anesthesia in Olshausen's clinic.

Mr. B. G. A. Moynihan of Leeds, England, writes that he has used it in 14 cases with no deaths. He uses Billon's stovaine. Has failed in one or two cases to produce anesthesia. As to age, he says: "I have only used it in old patients in whom I feared ether." One case has shown some shock from being conscious. He has gotten good muscular relaxation. He removed the cecum, ascending and part of the transverse colon in one case. He has done an ilio-sigmoidostomy in two cases. The other cases were bladder and prostatic cases. The anesthesia lasts a "good hour". Respiration was affected in one case, where the anesthesia was noticed as high as the xiphoid sterni. There has been no headache, nausea, rise of temperature or other complications following operation.

Prof. Döderlein of Tübingen had used it in 44 cases up to January 1, 1907. Observations were discontinued at that time, owing to the illness of the assistant who was in charge. He has had no deaths. In five cases there was a failure to produce anesthesia. "The older women are more readily anesthetized." Scopolamin with morphine is always given before operation. The anesthesia lasts long enough for any abdominal operation. The circulation and respiration were affected some in three women over 48 years of age, possibly due to Trendelenburg position. There was some nausea during operation and postoperative headache in 8 or 9 cases. One case had some postoperative rise of temperature. In two cases there was slight muscular paralysis of arm and neck lasting ten days.

Prof. Zweifel of Leipsic does not give the number of cases in which he has used stovaine. He has not had any deaths. He uses scopolamin and morphine. His operations are confined to the genital organs, vaginal and abdominal. The anesthesia lasts from one to one and a half hours. He has had two cases in which there was some respiratory trouble. A few cases have had nausea during operation. He rarely notices headache after operation. There has been no postoperative rise of temperature or muscular paralysis.

Prof. Tuffier of Paris has used stovaine in 530 cases without a death. With the exception of three cases, in which it was necessary to repeat the dose, he has never failed to produce anesthesia with the first injection. One case showed some shock from being conscious during operation. He finds that there is possibly a little more hemorrhage from the wound than with a general anesthesia. There is good muscular relaxation. He has operated upon the stomach and liver, but advises against it on account of the delicacy and uncertainty of this method. He never uses scopolamin and morphine. The anesthesia lasts about an hour. He rarely uses the Trendelenburg

position. There has been no vomiting during operation, nor has he been troubled with circulatory or respiratory involvement. His patients rarely suffer with headaches afterwards. There has been no muscular paralysis or postoperative rise of temperature or involvement of the heart, liver, or kidneys. Some observations have been made on the blood, but nothing abnormal was found.

Dr. Kuemmell of Hamburg reports 186 cases without mortality. He has failed to produce anesthesia in $\frac{1}{6}$ of his cases. There is no age limit; he has operated upon patients from 5 to 80 years of age. They rarely experience shock from being conscious. Scopolamin and morphine "seldom used and without effect." The anesthesia lasts one hour. There is good muscular relaxation. There is practically no cardiac involvement. Respiration is sometimes "affected in Trendelenburg position which is only used till anesthesia is perfect." Twenty per cent of the cases show some nausea during operation. About 25 per cent of his cases have headache after operation. He has never had any muscular paralysis. There has not been more postoperative rise of temperature than in chloroform narcosis.

Mr. A. E. Barker of London has used stovaine in 128 cases without a death due to the anesthetic. Two cases of general peritonitis died several days later in the course of the disease; and one case of cirrhosis of the liver, which was given $\frac{1}{2}$ grain of morphine, had suppression of urine and died the following day. The ages of his cases were from 15 to 71 years. He does not use it in nervous or excitable cases. A few have been nauseated and complained of some headache, but not of the severe type that some have reported. One patient complained of pain at the seat of the puncture lasting 24 hours. There has been no paralysis or aftereffects. There were 45 abdominal operations in the first 100 cases. General anesthesia had to be resorted to in only one instance — a case of prolonged operation for varicose veins. He has only used Adrenalin chloride in three cases. In his experimental injections of Adrenalin he has noticed that there is an ecchymosis or coloring of the tissues with blood pigment as though there had been small hemorrhages; and when injected into his own arm, there was for hours a sense of dull aching and fullness over the whole arm. His injections are made with the patient on his side or face, and the needle is introduced in the midline and a smaller blunt canula passed through this to prevent leakage of the solution and injury of the membranes and cauda equina. Analgesia is produced in from 5 to 15 minutes, lasting from 23 minutes to 2 hours; averaging 55 to 70 minutes. He has noticed that it extends higher on the side on which the patient lies. The usual dose is 3 to 6 centigrammes; with 5 centigrammes the analgesia usually extends up to the episternal notch.

He suggests that gravity plays a more important role in the results gotten with the various solutions than has been recognized, and gives for comparison the specific gravity of the spinal fluid and several stovaine solutions.

Liquor Spinalis (from three patients, mixed).....	1,0070
Chaput's Compound; Stovaine 10%, NaCl 10%, Aqua Dest. 80%	1,0831
Barker's Compound; Stovaine 10%. Glucose 5%, Aqua Dest. 85%.....	1,0300
Bier's Formula; Stovaine 4%, NaCl 11%, Epirenin Borate 0.01%.....	1,0058

He illustrates this by using three glass tubes with curves corresponding to the curves of the spinal canal, fashioned after Braune's plate of a frozen mesial section of a female cadaver; and filled with a solution of the same specific gravity as the spinal fluid. The stovaine solution, colored violet with methyl, is slowly introduced at a point corresponding with the usual point selected for spinal puncture, and a photograph taken two minutes later shows that the heavy solutions have gravitated downward (the pelvis being elevated 3 inches) to about a level with the 5th or 6th dorsal vertebræ, while Bier's solution, which is lighter than the spinal fluid, remains near the point of injection. In none of these solutions have the patients been able to overcome the hemolytic action of stovaine, as all show a swelling and gradual disappearance of the red cells, under the microscope.

Dr. W. W. Babcock of Philadelphia reports 65 cases in which he used stovaine without a death. The cases seem to have covered the general run of hospital work, hysterectomies, hernias, appendectomies, etc. The dosage was from 3 to 7 centigrammes; with 3 or 4

centigrammes the line of analgesia usually extended up to about on a level with the anterior superior spines. He found that nausea, pallor, and cardiac oppresion were not uncommon after the introduction of 7 centigrammes. He uses Adrenalin. He mentions the cases of three children 7 and 10 years of age operated upon; none of them seemed disturbed by the operation, and one of them went to sleep during the amputation of his leg. He says stovaine has a decided antiseptic action. In one case spinal anesthesia was used three different times, and at the last operation the spinal fluid was found free of cellular elements and there were no clinical symptoms of meningeal irritation. He thinks spinal anesthesia is superior to Crile's method of blocking shock, and cites a case in which shock from a crush of the leg was markedly reduced after injecting stovaine.

Maes & Logan report 12 cases operated upon with stovaine spinal anesthesia in the clinic of Dr. Matas of New Orleans. All of the operations were upon the lower extremities, genitals or rectum. There were no fatalities. The analgesia in all except one case extended as high as the umbilicus and in several cases as high as the mammæ, and lasted from 40 minutes to 5 hours. In one case the anesthesia was limited to the ano-scrotal region. In 5 or 6 cases there was some nausea and headache following the operation. Practically no rise of temperature. There was no muscular paralysis. In two cases "there was profound anesthesia and reactionary symptoms" from a relatively large dose.

Rauschhaupt reports 99 cases during the winter semester 1905-06 from the surgical clinic in Giessen, in which stovaine was used not only in adults, but also in children down to the age of six years. The anesthesia was good in 83, poor in 5 and failed in 11 cases.

Freund reports 209 cases from the Frauenklinik of the University of Halle; he classes 87 per cent as good and 13 per cent poor. In this group of cases he has used stovaine and novocaine indiscriminately with equally good results. All were laparotomies and Alexander-Adams operations, except about fifty cases. Ages ranged from 18 to 73 years.

Deetz reports 360 cases treated with Billon's stovaine in the surgical clinic of Prof. Müller in Rostock. He had about 50 appendix operations, 11 gastroenterostomies, one gastrectomy, one operation on the pancreas, about 40 hernias, etc. He gives the following table of his patients' ages: from $7\frac{1}{2}$ to 14 years, 41 cases; 14 to 20 years, 52 cases; 20 to 40 years, 149 cases; 40 to 60 years, 84 cases; 60 to 70 years, 16 cases; over 70 years, 13 cases.

Becker reports 135 cases without mortality. There were 81 abdominal operations; 30 appendectomies; 2 gastroenterostomies; and 22 hernias.

Adams has collected 1700 cases from the literature, most of which were attended to under stovaine.

PERSONAL EXPERIENCE

My personal experience with stovaine has been limited to a few cases. I have adopted the following methods in using it.

The patient is prepared the night before as for a general anesthetic, the field of operation and the lumbar region both being scrubbed and an antiseptic poultice applied. Two hours before operation scopolamin grains 1-100 with morphin-sulphate gr. $\frac{1}{4}$ is given by hypodermic. The ears are plugged with cotton, and colored glasses are put on the patient. I use Kocher's C.C. glass syringe with needles $3\frac{1}{2}$ inches long which I had made in Berne after his pattern.

When ready to give the stovaine, the patient is allowed to sit on the side of the table with his feet on a chair, and his elbows resting on his thighs; the back is again scrubbed, using permanganate of potassium and oxalic acid. Sterile towels or laparotomy sheets are wrapped around the patient. My gloves, syringe and needles to be used for the anesthesia are boiled separately. The neck of the flask or tube holding the stovaine is broken and the fluid drawn up into the syringe before the puncture is made. A line drawn from the crest of one ilium to the other posteriorly crosses the body of the 4th lumbar vertebra. The needle should be introduced just above this line between the 3rd and 4th lumbar vertebræ, about $\frac{3}{8}$ of an inch to one side of the mid-line, to avoid the strong interspinous ligament, which in some cases deflects it. The needle will enter from $1\frac{1}{4}$ to $2\frac{1}{4}$ inches and should carry a wire, which completely fills its cavity,

to prevent plugging with the skin or tissues; the wire should be withdrawn just before reaching the dura, and the needle slowly introduced until the spinal fluid begins to flow. Usually a few drops are allowed to escape, and then the syringe is attached and the plunger slowly withdrawn, allowing about one c. c. of the fluid to mix with the stovaine solution; then the fluid is slowly forced out, taking one minute for its introduction into the spinal canal. After the needle is withdrawn, a sterile gauze pad is applied to the puncture with adhesive. The patient is allowed to sit up for two minutes longer and is then generally ready for the operation to begin.

The anesthesia usually lasts about an hour. I use a preparation made by Billon of Paris after Bier's formula:

Stovaine	0.04
Adrenalin Borate	0.00013
Sodium Chloride	0.0011
Distilled Water	2.00

Besides the cases previously reported, in the following patients this method of anesthesia was used:

CASE 1. A colored boy, 13 years of age, was brought to St. Vincent's Hospital by Dr. T. H. Payne of Saginaw, Ala., on April 8th, 1907, with his left thigh crushed in the middle third, one of the driving wheels of an engine having passed over him about five or six hours previously. He was in a state of profound shock from the loss of blood and the jolting necessary in bringing him to the hospital. He was cold, pulse almost imperceptible, and respirations shallow and sighing. The shock seemed to be increasing, and we decided that a quick amputation offered the best chance of saving him. He was turned on his right side, and about 3½ centigrammes of Billon's stovaine was given him. In a few minutes his respirations became normal, and his pulse improved in volume. The analgesia was almost perfect in the right leg, but was not so good in the injured one, though sufficient to allow a thorough scrubbing of the limb. We gave him a small quantity of ether, and I did a quick amputation. Salt solution was given intravenously while the operation was in progress. His condition was better at the end of the operation than when we began. Except for an infection, beginning in the arm where the saline was given, his recovery would have been uneventful.

CASE 2. I was asked by Dr. Wheelan to give stovaine to a patient of his who was in poor condition for taking a general anesthetic; 4 centigrammes were given. Analgesia was good in the legs and on the abdomen up to about on a level with the anterior superior spines, but as the incision extended up higher, it was necessary to give a small quantity of ether. Intradural tension was quite marked, and this possibly restricted the anesthesia to some extent.

CASE 3. A man, 30 years of age, was admitted to St. Vincent's Hospital for the removal of a tubercular testicle. Six centigrammes of stovaine was used. Analgesia extended up to a level with the nipples and lasted about two and a half hours. When his hips were elevated to put on a spica bandage, it produced some nausea with pallor and cardiac oppression, which was relieved by giving whiskey by mouth and strychnine hypodermically.

FATALITIES AND DISADVANTAGES

Krecke reports the death of a man 70 years of age, with strangulated hernia and gangrene of the bowel. He used 5 c.g. of stovaine and had perfect anesthesia in a few minutes. The patient seemed to do very well until the loop of gangrenous bowel was opened, when he suddenly collapsed and died.

Deetz reports the death of a man 72 years of age, with gangrenous cholicystitis and general peritonitis; his condition was so bad that he was afraid to use an anesthetic at all. He injected 6 c.g. of stovaine, and in 4 or 5 minutes there was moderate cyanosis; pulse weak and respirations shallow. Artificial respirations were given with camphor hypodermically, and there was temporary improvement. In a short time his respirations stopped, and he died.

Freund reports the death of a woman 73 years of age, who had asthma and had been in very poor health for a number of years. Death occurred in 8 minutes after the injection was made.

Mr. Dean, surgeon to the London Hospital, reports the case of a man 43 years of age with general peritonitis, who had had pain and severe vomiting for 8 days. A volvulus was found, and during the untwisting of it the patient showed some cardiac and respiratory involvement, but improved under stimulation and artificial respiration. He died 9 days later of cardiac failure. He does not attribute the death solely to the anesthetic. He quotes the death of a case from meningitis in which Sonnenberg used stovaine, but as the case was one of general pyemia, he thinks the infection might have been metastatic.

Trantenroth reports the case of a woman 39 years of age, the mother of five children, who had sent for him after having had strong labor

pains for some time and requested him to use spinal anesthesia in applying forceps. She was placed on her left side, and several attempts were made before he succeeded in entering the canal. He used 6 c.g. of stovaine with Adrenalin solution. Twenty minutes later her pulse became small and slow and her respirations slow and shallow, and there was more or less cyanosis. Stimulants were used, and she soon recovered and the following day she felt well. On the third day she had severe headache, pain in back and fever, and there was partial paralysis of the right leg lasting for several months. He says he considers the first symptoms due to the stovaine poison and the last to a localized meningitis of the spine with a neuritis of the leg.

He also reports the case of a woman operated upon for a cyst of Bartolini's gland, who had pain and cramps in her left leg on the 12th day; there was some interference with sensation also. This condition persisted about four months.

Dr. Percy H. Swahlen, an assistant in Döderlein's clinic, reports two cases in which there was slight muscular paralysis in the neck and one arm, lasting about ten days.

Finkelnburg reports some accentuation of tendon reflexes in three cases, lasting several hours in two cases and thirty-six hours in the other. In some cases there was slight, temporary disturbance of micturition. In some cases there was a slowing of the pulse in from $\frac{1}{2}$ to $\frac{3}{4}$ of an hour after injection. In only one case, a man 54 years of age, was there any irregularity noticed.

Doenitz quotes four cases in which the respirations were bad, and it was necessary to use artificial respiration and stimulation; in one case the dosage was two times and in another two and a half times the usual dose given.

Deetz reports temporary paralysis of the sixth nerve appearing on the 13th day.

Adam reports a case of paralysis of the sixth nerve of a patient who applied to the eye clinic in Berlin three weeks after having had a hernia operation performed under stovaine spinal anesthesia.

CONCLUSIONS

Dean thinks stovaine spinal anesthesia is the ideal method to be used in acute abdominal cases. He thinks the shock in all cases is much less than from ether and chloroform, and that "the mortality is by no means so large as with the general anesthetics." He advises giving a small dose and repeating it in 10 or 15 minutes, if necessary.

Penkert states that in Prof. Kroenig's clinic in Freiburg they have only given a general anesthetic 35 times in a series of 400 major gynecological and abdominal operations, and that these were given either at the request of the patient, the family or the doctor sending in the patient for operation. They use stovaine not only in the general clinic work, but in their private work also. After having used novocain, alypin, tropacocain, and stovaine, they prefer the latter.

Becker thinks that spinal anesthesia will reduce, very materially, the use of general anesthesia.

Tillman has gotten perfect anesthesia and has never had any bad effects during or after operation. He has noticed that some of his cases had headache afterwards, but were greatly reduced if a glass of wine were given immediately.

Jordan suggests that spinal anesthesia should be used in toxemia of pregnancy, when an anesthetic is needed.

Heinike and Laewen give an exhaustive analysis of 70 cases each of novocain and stovaine and come to the conclusion that the untoward effects of novocain are $2\frac{1}{2}$ times more frequent than with stovaine. This applies not only to the light and unimportant effects, but also the disturbance of heart action in collapse. They say that the intradural application of novocain has dangers which are markedly greater than that of stovaine with the identical technic.

Moynihan uses stovaine spinal anesthesia in old people where he fears ether.

Kuemmell uses it in cases from 5 to 80 years of age.

Rauschhaupt uses it in children down to the age of 6 years.

Deetz reports 13 cases of over 70 operated upon and gives $7\frac{1}{2}$ years as his youngest case.

It is possible to do almost any operation under spinal anesthesia, as breast amputations, gastroenterostomies, gastrectomies, operations

upon the pancreas, gall bladder and kidneys, hysterectomies, appendectomies, etc.

TOTAL NUMBER OF CASES

Adam (most of them stovaine)	1,700
Barker	128
Babcock	65
Becker	135
Bier	103
Chaput	309
Dean	6
Döderlein	44
Deetz	399
Freund (some novocain)	209
Heinike & Laewen	250
Hermes	91
Kendirjy	325
Krecke	25
Kuemmell	186
Maes & Logan	12
Mercier	27
Moynihan	14
Penkert	over 400
Rauschhaupt	99
Rosthorn	107
Tillman	130
Torrance	7
Tuffier	530
Varvaro	136
Israel	91
Total	5,532

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CHEILOPLASTY FOR ECTROPION OF THE LOWER LIP

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PLASTIC surgery of the face is an art which has come down to us through many centuries. It may have had its beginning in India, for we find references in the works of the older writers to the marvelous operations done in that country in repairing multilations of the nose and face.

Among the earliest writers on the subject is Gasper Taliacotius or Tagliacozzi, who in 1597 published a work on surgery, one chapter of which is devoted to a discussion of the treatment of deformities of the lips. The writings of this Italian surgeon are well worth an examination both from the point of view of the surgeon and also that of the bibliophile.

During the next two centuries little attention was paid to this branch of surgery, and it is not until in the early part of the nineteenth century that we find in the writings of Morgan, Serré, Blandin, Rigaud and Blasius an apparent revival of interest in this line of work. Some years later there came another group of men among whom may be mentioned Gyoux, Poncet, Ghedini, Schaefer and v. Szymanowski, who, building upon the work of their predecessors, made many advances both in operative procedure and in the general art of plastic surgery.

It is not our intention to go deeply into the subject from the historical standpoint, for this has been recently thoroughly discussed by such men as Athanasoff, Roberts, Nélaton and

Ombrédanne whose writings may be easily obtained.

The object of plastic surgery is to correct anomalies of shape or to replace defects in tissue, due either to disease, accident or operative procedure. There may be said to be three general methods of plastic surgery, and in a plastic operation one of these methods or a combination of two is almost always used. These are known as the French, the Indian and the Italian method, and the chief points of each are briefly as follows:

In the *French method* the tissue for the repair is taken from a point near the defect and is slipped into position with only a slight traction on the pedicle.

The *Indian method* differs in that the tissue for the repair is taken from a point a little distant from the defect and is brought into place by being twisted upon its pedicle, often being lifted across an intervening strip of undisturbed skin.

The *Italian method* of repair is that in which the tissue is taken from some part of the body, perhaps at quite a distance from the defect, and is held in approximation by sutures and bandages for some days before the secondary operation of cutting the pedicle is done.

In the entire subject of plastics the division on surgery of the lips or cheiloplasty, is perhaps second to none in interest, not only to the surgeon and the patient, but to the patient's friends. No other part of the human face, unless possibly the eyes, plays so great a role in facial expression as does the mouth. Malformations of the lips not only are unsightly, but they also have their effect upon mastication and especially upon phonation.

The chief indications for plastic operations are three:

1. To correct congenital deformities.
2. To repair, so far as possible, defects following certain surgical operations.
3. To repair lesions due to accident.

Such operations may be subdivided into two classes:

1. Operations of necessity or those requiring immediate attention.
2. Operations of choice or those of a secondary type.

Under the first class would come such cases as the one reported by Watts, whose patient's lower lip had been bitten off by a pony; or that reported by Hurt in which half of the patient's upper lip had been bitten off in a fight. Much more common examples of cases of this class are those requiring reparative operations after the excision of epitheliomata. In the early days such wounds were usually allowed to heal by granulation, the result being almost as terrible as the disease, but with the rapid advance of surgery during the latter half of the last century many operations were devised with the view of obtaining a complete excision of the new growth and a minimal disfiguration and impairment of function. These operations, as will be seen, follow one or more of the three general methods or schools of plastic surgery. Among those using the French method are Larger, Dowd, Silberberg and Grant, whose operations were chiefly based upon the mobility of flaps taken from the tissues of the chin and lips. Van Hook followed the same idea, but varied it in that he utilized the skin surface as a substitute for the lost mucous membrane. Kammerer reports a case in which he repaired the lower lip after excising an epithelioma by taking his flap from the cheek instead of from the chin, the advantage being that of having an internal mucous surface. Morestin and Schultén made use of flaps or bridges of tissue taken from the other lip.

Among the advocates of the Indian school are Lavis, Polaillon, Winnett, Sandelin and Steida, who used a "visorplastic" method of substitution, a bridge of tissue being taken from the throat and slipped up in the place of the excised lower lip.

Chief of those who follow the Italian method is Berger, who replaced the tissue excised by a flap taken from the arm, the method used also by Watts in treating his case of traumatic loss of the lower lip.

Under the second class of operations, more of choice than necessity, we would group the congenital defects and the malformations resulting from such accidents as burns and scalds. The treatment of hare-lip and similar deformities is thoroughly discussed in the text-books on general surgery and will not be taken up here.

It is our intention to consider briefly the labial deformity which frequently follows burns

of the face and neck and to report a case which may be of some interest to those of the profession who are interested in plastic surgery. It is with considerable hesitation that we do this, but as Elwell has so tersely put it: "The numerous methods described in standard works for the restoration of the lower lip may fairly be accepted as evidence that no one of them is entirely satisfactory under all conditions," and this with the fact that comparatively few cases of this sort have been reported, may in a measure justify our action.

Of all the lesions about the mouth eversion or ectropion of the lower lip due to cicatricial contraction following extensive burns of the face, neck and chest, is by far the most distressing and the most difficult to remedy. The congenital deformities, if taken in time, may usually be treated very satisfactorily. The new growths occur late in life and usually in males, and if properly treated the prognosis is good and the scar of operation not especially noticeable. Burns, however, usually occur during childhood after the victim is old enough to go about and after the face has become more or less definite in outline. Sex can have no influence in the liability to this form of accident, and where the injury does occur in a male the nature of the injury usually precludes the possibility of the scar being hidden by the beard in later life. Burns involving the deeper tissues about the chin and neck are almost invariably followed by deformity, and the very fact that such an injury destroys the skin and the muscles and other structures immediately beneath the surface, replacing them by dense and firmly adherent scar tissue, renders operative procedure often unsatisfactory, difficult or impossible.

What is more distressing than to see a young child with the entire lower half of its face covered by the glazed scar which follows a burn, its head drawn forward and its lower jaw drawn downward, due to contracture of the tissues of the neck, and with its lower lip everted, the teeth and gums showing, and a consequent constant drooling of saliva and interference with speech and mastication!

The object in the relief of such a case is a double one. The end desired is not merely a mass of tissue firmly fixed to the lower jaw, but the aim should be to approach as nearly as possible the normal. The cosmetic and the functional results must both be considered. In no two cases will the surgeon find exactly the same degree of involvement or condition of the tissues with which to repair the deformity, and consequently each case will have its own problems for solution, and will be more or less a law unto itself. It is rare that the involvement is so slight as to allow of satisfactory repair by following the widely quoted and time-honored method of Blasius, that of making a V-shaped incision corresponding to the outlines of the everted lip, raising the lip into normal position and closing the wound thus made in the form of the letter Y.

Redard reports a case of ectropion of the lower lip which he operated upon with excellent results, using briefly the following method: The more deeply scarred areas were excised and all cicatricial bands were freed sufficiently to allow of the lip being replaced in normal position. Grafts were then taken from the arm and cut to fit the denuded areas, but with sufficient margin to allow for contraction. These grafts were then sutured in place and the dressings applied.

Berger reports the cure of a case in which he excised the scar and covered the denuded area by a flap taken from the arm.

Jacobson in a recent article points out several deficiencies in the usual cheiloplastic operation, especially where the denuded area is covered by skin grafts. These deficiencies are chiefly in the operator's inability to overcorrect the deformity and to so fix the lip and the grafts in position that satisfactory union will result. He reports two cases, done by what he calls the "skewer-method" with very satisfactory results.

Briefly his method is as follows: A flap consisting chiefly of the mucous membrane of the everted lip is dissected upward, care being taken to secure sufficient tissue to allow an overcorrection of the deformity. This flap is now held in its slightly overcorrected position by being transfixed upon a silver probe which is passed through one cheek and, traversing the reflected tissue, pierces the other cheek at a slightly higher level than that which the repaired lip is expected to maintain. The lip

now being securely held in the desired position, the denuded area is completely covered by Thiersch skin grafts which are secured by sutures and dressings.

Jalaguier advocates a method in repairing cicatricial deformities similar to that used by Morgan, Lockwood, Winnett and Steida in their plastic operations after excision of epitheliomata, namely the use of visor-like bands or bridges of tissue taken from the neck or throat and brought up over the chin to cover the defect.

The case which we wish to report was one in which the method used we later found to be

Fig. 1. Sketch of condition previous to operation.

similar in many respects to that of Jalaguier. It had, however, a few points of difference, a consideration of which may be of some interest.

The patient was S. G., a small boy 4½ years old, first seen in the clinic and referred to us through the kindness of Dr. J. M. T. Finney. He was admitted to the Union Protestant Infirmary on March 11, 1907, being brought by his parents because of "trouble with his lower lip." He was kept in the hospital for a few days before operation, that we might study his case and that he might accustom himself to his new surroundings, a point the benefit of which is perhaps greater than is usually recognized.

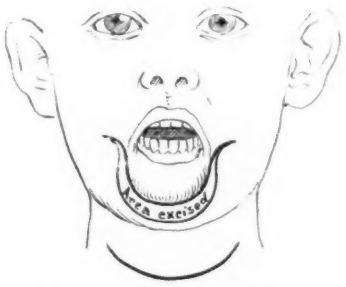

Fig. 2. Outline of incisions made.

Past History. Negative, except for pneumonia when two years old.

Present Illness. While convalescent from pneumonia patient fell into an open fire and was severely burned about the face and chest.

Physical Examination. Negative throughout, except for extensive scar from burn above mentioned. The skin over the front of the chest and abdomen and over the face from the ears across to the mouth and downward including the chin and with a few marks on the nose — was one expanse of scar. The head was pulled slightly forward, the corners of the mouth were drawn down and the lower lip was rolled outward, exposing the teeth and gums and allowing a constant drooling of saliva. The tissue of the lower lip was greatly thickened, at two points being deeply pitted and so firmly fixed that the vermillion edge could not be brought into normal contact with that of the upper lip even by the use of considerable force. The mouth was held open constantly, and no attempt was made to use the lips in speaking.

Operation. March 21, 1907. Ether anesthesia.

The first incision was made along the mucocutaneous border of the everted lower lip and extended one-half an inch beyond the angle of the mouth on either side. By sharp and blunt dissection downward over the chin through the dense scar tissue and outward on either side to the point of entrance of Stenson's ducts, all fibrous attachments were freed to allow proper mobilization of the remaining portion of the lip. A second slightly curved incision was then made transversely

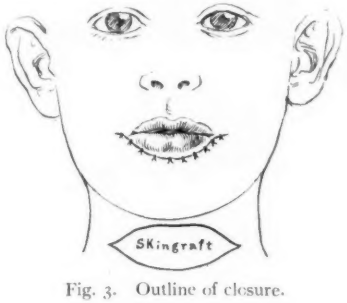

Fig. 3. Outline of closure.

Fig. 4. The result 10 weeks after operation.

on the throat at the level of the thyroid cartilage — the "suicide's incision." This incision, which extended through the skin and subcutaneous fascia, was about 4 inches long, with its ends pointing upward toward the angles of the jaw and its convexity downward. By sharp and blunt dissection the bridge of tissue between the two incisions was thoroughly freed and all hemorrhage controlled by fine catgut ligatures. It was thought best to excise a strip perhaps half an inch wide from the upper border of the bridge of tissue, as being too badly scarred to use. On careful examination a few fibres of the orbicularis oris inferior were found to be intact though badly relaxed and atrophied, owing to the position in which they had been held for so long a time. With the idea that a better cosmetic and functional result might be obtained by shortening this relaxed muscle, even with the added danger of soiling a wound which up to this time had been kept fairly surgically clean, it was decided to excise a small portion of the muscle at either angle of the mouth where it joins the fibres of the obicularis oris superior. This was done, perhaps a quarter of an inch being excised at either angle and the cut ends brought together and sutured with buried catgut. The result was surprisingly good, for now instead of having a flabby relaxed mucous border of the lower lip we had a firm, well held and slightly overcorrected edge. The remainder of the operation consisted in bringing the "bridge" or visor-like band of skin and subcutaneous tissue up over the chin till its upper margin was in contact with the vermillion border of the lower lip. Here it was fastened by a row of interrupted sutures of fine black silk, the approximation being very satisfactory. To prevent this "bridge" from slipping downward and causing traction upon the lip, it was anchored to the deep mental tissue by two buried sutures of catgut and two "in and out" sutures of heavy silk, each of which included a portion of the periosteum of the chin. The bridge of tissue was easily moulded into shape over the chin and upper part of the throat and the area now exposed upon the neck was covered by Thiersch grafts taken from the thigh. The area which it was necessary to graft was oval in shape and perhaps $2\frac{1}{2} \times 4$ inches in its diameters. The grafts and the line of incision along the mucocutaneous border were dressed with silver foil and gauze, the lip being also held by a band of adhesive plaster brought across it from cheek to cheek. Bandages reinforced by crinolin were then applied, taking in head, neck and chest in such a manner as to immobilize this portion of the body, the head being drawn slightly backward, the chin being raised and the lip held in an overcorrected position. To prevent soiling the wound by vomitus and secretions from the mouth the margin of the dressing was covered by rubber protective which was fastened along the vermilion border of the lip by a light coating of collodion, the lower edge being caught by a turn of bandage.

The thorough routine lavage while under ether was done previous to the application of the dressings. The patient bore the operation well and recovered quickly from the anesthetic with practically no nausea. Water was started six hours after the operation and by the next day the patient was taking any liquid, all fluids for the first three days being given through a rubber tube.

Convalescence was uninterrupted save for slight rises of temperature on the fifth and fourteenth days, due apparently in the first case to a collection of fluid under the "bridge" and in the second case to tonsillitis. Both responded promptly to treatment. The stitches along the mucocutaneous margin were removed at the first dressing, which was done on the fifth day. Union excellent and grafts apparently healthy. After the first week the patient was allowed to be up and to go about as he pleased, the head, neck and chest, however, being fixed by stiff bandages. Three weeks after the operation, the grafts having taken well, all bandages were removed and daily massage of the lip, chin and neck was commenced. Within a short time the patient began to gain control of his lip and by the eighth week he was able to whistle — an accomplishment which he had been promised would win for him his discharge from the hospital.

In reviewing the case there are a few points which seem worthy of notice, viz., the advantage of,

1. Free incision to allow proper mobilization of the lip and of the tissue used in the repair.

2. Shortening the relaxed orbicular muscle where such is present.

3. The use of tissue taken from the neck rather than from some other portion of the

body because of the possibility, in males at least, of the scar being covered later by a beard.

4. Massage after the tissues are well healed as an aid to muscular control, a prevention of secondary contractions and a means of minimizing the scar.

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A BRIEF SURVEY OF THE GENERAL KNOWLEDGE OF BONE REGENERATION, AND CERTAIN FEATURES OF OSTEOMYELITIS

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ALTHOUGH we use the terms acute and chronic in classifying osteomyelitis, they scarcely describe the conditions, considered from the points of view of an infective process and a destructive process. Bone infection in any given case may mean a process so virulent, that death results before local destruction is very far advanced. Again, the process may be ushered in with severe symptoms of septic infection, and in one bone the local process may be quickly destructive, while in other bones of the same subject local destruction may amount to very little. In some of the essentially chronic forms, bone destruction may be quite out of proportion to the amount of systemic infection. Even in different areas of the same bone, destruction may be very variable.

These remarks are applied to pyogenic osteomyelitis of hematogenous origin, which is the kind most frequently met with. It is essentially a disease of the young. The infection usually begins in the medulla of the diaphysis, in the region of the intermediary cartilage; from there the infection spreads in different directions, the course and results depending upon the anatomical relations of the articular ends of the bone.

Early in the infection the radiograph frequently shows a periosteal exudate or thickening, extending almost the entire length of the shaft. Succeeding radiographs show that this exudate becomes absorbed, and that the destructive process has become localized in the cancellous tissue of the end of the shaft.

In a disease presenting so great a variability in its manifestations, the observation of individual cases will always help to complete the composite clinical and pathological picture.

The advent of the radiograph has made it possible to combine the clinical and pathological study in a manner hitherto impossible. I wish to present, from this point of view, the following cases which form the basis of this paper.

Case 1. A girl, six years of age, became suddenly ill, with symptoms of a severe infection in December, 1904, followed in a short time by the formation of abscesses in the right forearm, left thigh, and right side of face, and swelling over the left elbow, with fixation of the joint, and swelling in the middle of the right arm. The superficial abscesses were opened by the attending physician, and the parents refused for some time to allow any further operative procedures. An opportunity was thus furnished for a radiographic study of destruction and repair in the various bones affected. The infection was by the staphylococcus albus and citreus.

1. *The Right Ulna.* The first radiograph (Fig. 1), taken about two months after the onset of the trouble, shows the old shaft partially destroyed, and surrounded by the periosteum forming new bone, which is deficient at one point. In the olecranon process there is still seen some of the trabeculæ of the spongy bone. The process has evidently stopped short at the cartilaginous epiphysis. Successive radiographs, taken during a period of about a year, show a gradual melting away of the old shaft; all that remained at the end of that period being a few fragments of about one-half inch in length (Fig. 2). An operation undertaken at this time disclosed an irregular cavity extending the entire length of the shaft, filled with shaly material and granulation tissue. There were several small pus cavities in the spongy bone of the olecranon, one of which extended to the joint surface. This on being opened, and the joint cartilage punctured, a quantity of turbid fluid escaped from the joint cavity. Fully one-half of the new shaft was removed, to obliterate the cavity referred to.

Experience with other cases has shown me that this cavity containing granulation tissue will in time be encroached upon by the new bone formation in such a manner, that smaller cavities containing granulation tissue are shut off and will eventually cause trouble. A radiograph (Fig. 3), taken eight months after the operation referred to, shows a shaft somewhat deformed, but the trabecular arrangement of the ends is perfect — there is what seems to be a new medullary cavity, and the bony nuclei of the epiphyses are now visible.

2. *The Left Femur.* There is seen a periosteal exudate extending for at least two-thirds the length of the shaft. Numerous areas of destruction are seen in the lower metaphyseal region (Fig. 4). There was a marked effusion in the kneejoint. The only surgical interference was the opening of the abscess in the thigh. A radiograph, taken one year later (Fig. 5), shows that in the metaphyseal region the trabecular structures are almost normal in appearance. A little higher in the shaft the trabecular arrangement is still somewhat irregular. The periosteal exudate has entirely disappeared. Still a year later, the appearance is almost normal, although the whole lower end of the bone is somewhat thicker than the normal femur. The left humerus (Fig. 6) shows a small focus in the external

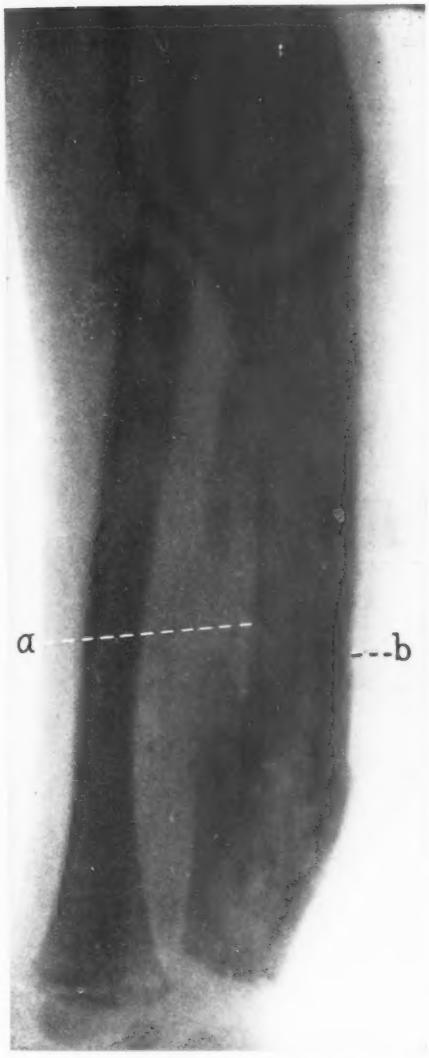

Fig. 1. Ulna of Case 1, showing (a) old shaft partially destroyed, surrounded by new bone (b) formed by the periosteum. The radiograph taken two months after the onset of the trouble.

Fig. 2. Ulna of Case 1, taken seven months later than Fig. 1, showing (a) part of the old shaft.

condyle and in the region of the olecranon fossa, and a periosteal exudate over the external condyle. There has also been later an extension through the cartilage into the epiphysis for the capitellum, one small corner of which has been destroyed (Fig. 7). At operation pus was liberated from the joint. The radiograph, taken about eight months after the operation (Fig. 8), shows that regeneration has been complete, and the interesting fact that the formation of the olecranon fossa corresponds very closely to that of a normal one (Fig. 9), demonstrating beautifully the power of repair, and the restoration of anatomical detail demanded by function.

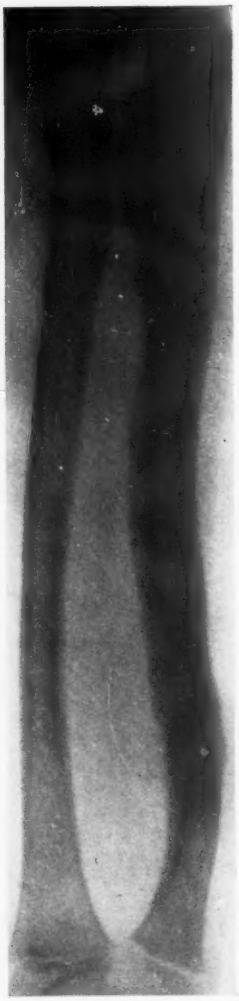

Fig. 3. Ulna of Case 1, taken eight months after the operation referred to in the text.

It is possible, that the reproduction of anatomical detail in the young may mean that the physiological influence determining architectural peculiarities is still present, irrespective of mere mechanical influences. This child was up and around in about six weeks. The movement of the elbow and kneejoints are practically perfect.

Case 2. Patient aged twelve years. The radiograph is of a process one month old (Fig. 10). It has extended from the epiphyseal cartilage of the head to the epiphyseal line of the lower end. There is a periosteal thickening the entire length of the shaft, varying in the different parts; about two inches of the shaft, just distal to the upper epiphyseal line, is very badly disorganized, leading practically to a separation of the epiphysis. About the middle of the shaft, the cortex shows evidences of great destruction, and at this point the periosteum is especially thickened. Distal to this again, the shaft for about two inches looks comparatively sound, and the periosteum is not so much thickened. There is also considerable destruction of the spongy end in the region of the condyles, the regular trabecular lines being interrupted. In their place, one sees what seems to be fragments of the trabeculæ. The second radiograph, taken six weeks later, looks as if there had been a general cleaning up. The periosteal thickening is everywhere a little more marked, the area of the shaft containing the sequestrum has an especially thickened periosteum. The third radiograph (Fig. 11), taken four months later than the first one, shows that the upper end of the old shaft (sequestrum) is gradually being eaten away — the inner surface of this structure having a particularly worm-eaten appearance. The upper epiphyseal line is plainly seen, and distal to it a very narrow area of bone. The new periosteal bone has

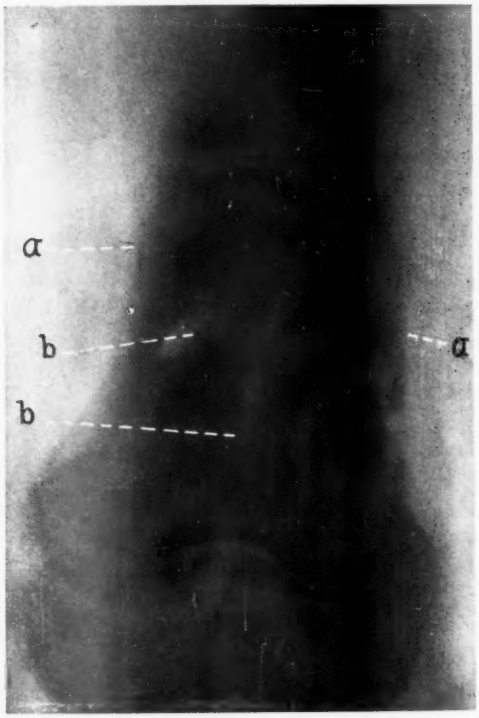

Fig. 4. Femur of Case 1, showing (a) periosteal thickening and at (b) areas of destruction in the spongy bone of the lower end.

become attached to the old head, as evidenced by the radiograph, and clinically by the fact that the head rotates with the shaft, considerable joint-movement now being possible.

Case 3. Patient aged fifteen years. The first radiograph taken three years after the onset of the trouble. There has been, in this case, no operative interference. The radiograph (Fig. 12) shows part of the lower end of the old shaft of the humerus. Following the axis of this old shaft upwards, as far as the lower and inner aspect of the present head, is seen the shadow of a large sequestrum (old shaft). On the outer side of the sequestrum, in a slightly different axis, is a new shaft, and, according to my interpretation, a new head. The new shaft presents the usual dense new formation so common in periosteal regeneration. The regenerated head is slightly smaller than the normal one. A radiograph, taken after the removal of the sequestrum (Fig. 13), and which shows the whole length of the humerus, demonstrates more clearly the formation of this new head. The most striking feature is the absence of the intermediary cartilage. The projecting tuberosity is also seen. The internal architecture, however, is entirely changed. In place of the regular fine trabeculæ,

Fig. 5. The same bone as in Fig. 4, one year later.

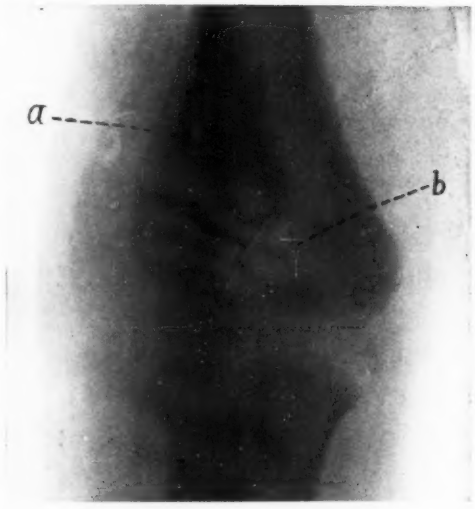

Fig. 6. Lower end of humerus, Case 1, showing (a) the periosteum lifted away from the bone by granulation tissue; (b) destruction of spongy bone in the region of the olecranon fossa. Radiograph taken ten months after the onset of the trouble.

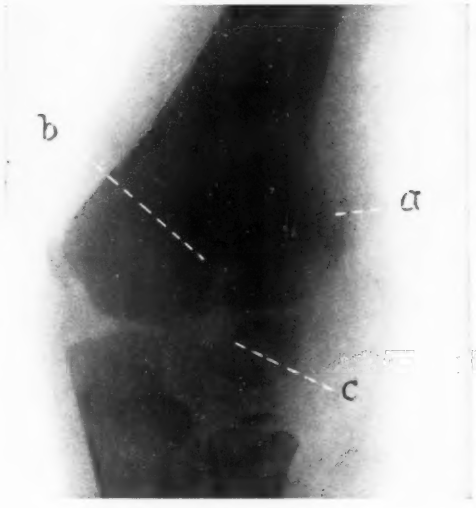

Fig. 7. Lower end of the humerus, Case 1, taken four months later than Fig. 4, showing (a) periosteal exudate; (b) some new bone formation in the region of the olecranon fossa; (c) small area of destruction in epiphysis. Radiograph taken one year after the onset of the disease.

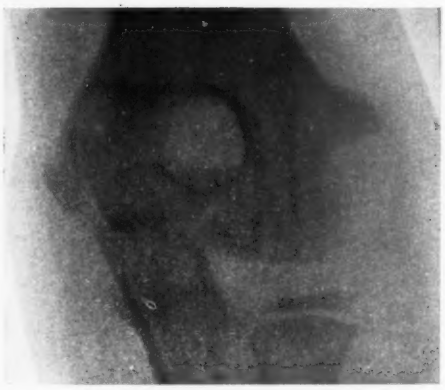

Fig. 8. Lower end of the humerus, Case 1, eight months after the operation referred to in the text, showing the almost normal outline of the olecranon fossa.

we see coarser and more irregular ones running in various directions. The new part of the shaft has evidently been derived from the periosteum on the outer half of the shaft; distal to this again is the lower end of the bone which, as far as the epiphysis, had evidently been subjected to a good deal of destruction with regeneration, judging by the irregular arrangement of the trabeculæ. The elbow-joint function is normal — there is a small amount of movement in the shoulder joint.

Case 4. Patient aged nine years. The first radiograph represents a process about five months old, in the

Fig. 9. Lower end of the normal humerus, Case 1.

Fig. 10. Humerus of Case 2. Radiograph taken one month after the onset of the trouble, showing periosteal thickening at (a). Destruction of the shaft leading to epiphyseal separation is shown at (b). Diffuse destruction of the lower end is shown at (c).

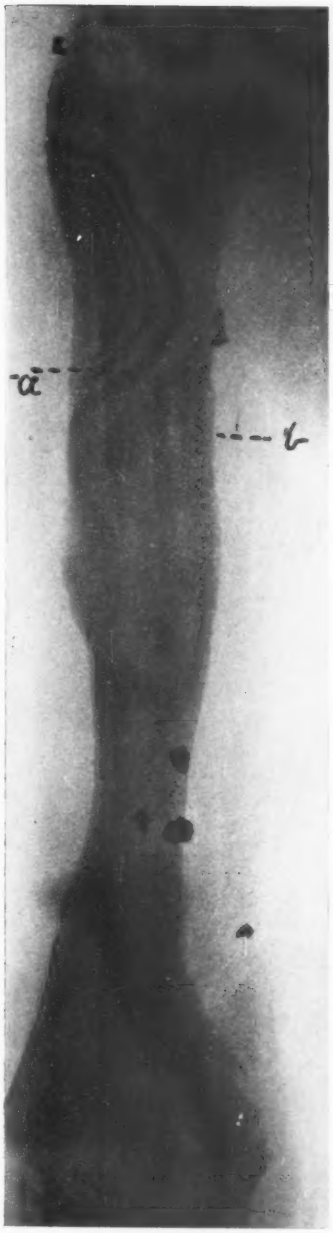

Fig. 11. Humerus. Case 2. Radiograph taken four months later than Fig. 10, showing upper end of the old shaft (sequestrum) at (a), the new shaft surrounding it at (b).

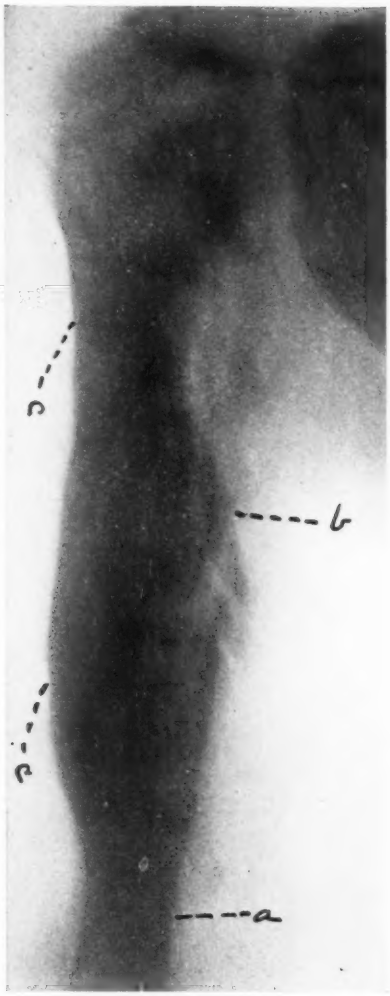

Fig. 12. Humerus. Case 3. Radiograph taken three years after the onset of trouble. At (a) is seen the old shaft; following this upwards, the old shaft is seen as a sequestrum at (b). The new shaft is indicated by (c). Note the new head.

head of the tibia (Fig. 14). There is a triangular area of destruction with the base toward the joint line. The process has extended through the intermediary cartilage into the epiphysis, from thence through into the joint. The second radiograph (Fig. 15), taken four months later, shows that the joint line of the epiphysis is again even, and that the trabeculæ of the epiphysis are again assuming a more regular appearance. The third radiograph, taken six weeks later than the second one,

Fig. 13. Radiograph, showing full length of humerus. Taken after removal of sequestrum.

shows no perceptible change. Clinically, the surface of the tibia is felt to be quite even. There is a small sinus leading to the cavity demonstrated in the bone. The destruction is evidently confined to the trabecular structures. The repair of the epiphysis would seem to have been accomplished by the tissues within itself.

CASE 5. Patient aged fourteen years. The first radiograph, taken fifteen months after the onset of the trouble, shows a process which involves the bone from the kneejoint to the middle of the shaft. A superficial sequestrum is seen in the cortical substance; as the spongy bone is approached, the process has destroyed the trabeculæ in a rather diffuse manner, and has extended through the epiphyseal cartilage into the epiphysis — the extreme internal aspect of the epiphysis being pretty badly destroyed. The second radiograph, taken one year later than the first, and about the same time after the removal of the sequestrum and a lot of shaly detritus from the spongy end of the bone and epiphysis, shows an approach to regularity in the trabecular formation; in the spongy end of the shaft and the rest of the epiphysis it is noticeable that the area in the extreme internal aspect of the epiphysis, which had been so completely destroyed, has not at this time been regenerated.

CASE 6. The radiograph of the femur (Fig. 16) of an adult, the subject of chronic osteomyelitis, is exhibited to show the area of bone production (sclerosing osteitis) in the interior of the spongy tissues of the shaft.

Ranking as the most highly differentiated of connective tissues, the regeneration of the bone has excited an amount of interest quite in keeping with its importance. The facts established by experimental work have been for many years applied in a practical and most beneficent

Fig. 14. Tibia, Case 4, showing a triangular area of destruction at (a), invading the epiphysis at (b), and extending into the joint at (c).

Fig. 15. Tibia, Case 4. Radiograph taken four months later than Fig. 14.

manner in clinical work. It is conceded, that to the periosteum must be attributed the greater share of the regenerative function, as far as the shaft proper is concerned, but that the medulla is capable of producing bone tissue there is no longer any doubt. It is also established that regeneration of the blood-forming elements of the medulla is very active. To restore function still more completely, it is essential that bone shall be reproduced not only in quantity, but that the architectural peculiarities be as nearly as possible restored, especially in the articular ends. As to whether after the formation of the new shaft from the periosteum a new medullary cavity is formed, seems doubtful. Schuchardt says: "It is doubtful if the bone-forming and bone-resorbing elements of the medulla are regenerated. Bones in which the medulla has been destroyed by acute osteomyelitis, for example, possess a very slight tendency to restoration of their inner architecture, even when, after correctly timed operation, favorable conditions have been established. Usually the new periosteal bone remains through life as a thick sclerosed mass, devoid of a medullary canal."

In the final radiograph of the ulna, in Case one (Fig. 3), it looks as if a medullary cavity exists and the inner architecture of the ends has been restored, as evidenced by the fine trabecular arrangement. As to the origin of the new medulla, there were still no doubt remnants of medullary tissue left in the spongy bone of the upper end of the ulna, but at the lower end this tissue appears to have been completely destroyed. Inasmuch, however, as the cartilage of the epiphysis had not been destroyed, it is possible that the trabecular arrangement owes its origin to the endochondral bone production going on at the junction of epiphysis and diaphysis. In the femur of the same case (Figs. 4–5), there had been no gross sequestrum formation, but evidently only a gradual melting away of the medulla and trabeculæ, followed by a regeneration of trabeculæ in regular arrangement. Here, however, there was not any doubt about the fact that there was plenty of medullary tissue. When this regular trabecular arrangement is found, we can, I think, assume that the alveoli contain medullary tissue. Bajardi says, "that after the destruction of the medulla, it is soon regenerated, that it is derived from vessels in the Haversian canals opening into the medulla, that it is first like granulation tissue, and later becomes like ordinary medullary tissue."

Case six (Fig. 16) would seem to show marked bone-producing properties of the medulla, for as well as the periosteal osteophytic productions externally, there is a most marked sclerosing process (bone production) going on in the interior.

In seeking for an explanation of the seemingly slow regeneration in the epiphysis, we find that the normal rate of growth in this region is very slow, especially after all of the cartilage of the epiphysis, except the intermediary disc, has been substituted by bone. The periosteum here too, it will be remembered, has no osteogenetic layer, and inasmuch as the intermediary disc is concerned only with the growth of the bone on its diaphyseal side, regeneration must come apparently from the medulla and trabeculæ.

Fig. 16. Showing the osteophytes on the exterior, and the sclerosing (bone-production) process in the interior.

Experience with excision of joints, when the excision falls close to the intermediary disc, has shown that regeneration is very limited. In Case three, we cannot say of course from actual observation how much of the head was destroyed, but, as remarked above, the smaller size of the head, the absence of the intermediary disc, and the irregular trabecular arrangement, all point to an entirely new formation. While this is, in a sense, a new epiphysis, it has no intermediary disc, and it is apparently of periosteal origin. It will be remembered, however, that in the physiological ossification of the epiphysis bone formation occurs along the vessels growing into the cartilage from the perichrondrium.

Numerous cases of new joint formation have been reported, after subperiosteal excisions. One is pictured in Lossen, in which the new joint after excision of the elbow is almost perfect. In our case, the destruction was subperiosteal, as evidenced by the new shaft, but inasmuch as the sequestrum (old shaft) lay entirely to the inner side of the arm, the periosteum was evidently destroyed on the internal aspect of the bone, and did not take part in the formation of the new shaft. If this new head is entirely of periosteal origin, it is interesting that the trabecular arrangement is so perfect. As early as 1694, Dellamotte resected periosteally in a case of compound fracture of the tibia six inches of the shaft, and eight months later this was restored. Heine, in a large number of resections of epiphyses, leaving the attachment of the joint-capsule ligaments and tendons, demonstrated the restoration of the articular ends, with joint function, the formation of the joint end of the bone being always more perfect, when only one bone entering into the formation of the joint was resected. Langenbeck in 1859, resected the head of the humerus sub-periosteally, leaving the attachment of the muscles, ligaments and capsules, and two years later demonstrated post-mortem a new head covered with hyaline cartilage.

Because of the variability of the destructive process in osteomyelitis, the surgeon's task must be a variable one. Speaking generally, the cases come to him either in the acute stage, where the immediate duty is the liberation of pus; in the stage of further destruction, or when destruction and repair are both at work. In the most virulent and destructive forms of infection, where life is spared, but an entire shaft is destroyed, after the liberation of pus the problem becomes one practically of deciding when to remove the sequestered shaft.

Holmes, in 1866 (Lancet, 1866), removed the diaphysis of the tibia in osteomyelitis one month after the onset, and saw a new shaft form. He then reviewed the advantages and disadvantages of the early removal of the shaft. He considers nine months as the average time consumed in the restoration of function after early removal.

In spite of the brilliant results obtained in isolated cases, like that of Holmes, the early removal of the shaft has not been common practice. The fear of failure on the part of the periosteum to do its duty, and the clinical fact that the infective process and the presence of the sequestrum as a foreign body act as exciters of periosteal activity, probably furnish the reason why this method has not been generally adopted. Nicolls, however (Journal American Medical Association, 1904), upon the basis of an extensive experience, has recently advocated very strongly the early removal. The illustrations accompanying his paper show his results — the time necessary for their accomplishment is also given.

It is astonishing how frequently an acute process which in the radiograph shows a periosteal thickening, extending almost the entire length of the shaft, will after the liberation of pus settle down to a more or less chronic process localized in the spongy end of the shaft, and this, too, when there has been no operative attack upon the bone. Repeated observations of this kind have led me to think that in a certain number of cases the infectious process has already spent its force by the time the surgeon sees them, or by the time the diagnosis has been made, and that drainage established down to the bone is all that is necessary.

In Case seven, for instance, the patient was admitted in a most prostrated and toxic condition. Under ether, an incision in the thigh liberated a very large collection of pus. The exploring finger detected bare bone as far as it could reach. The patient's condition, even in the short space of time required for this small

amount of work, became very critical indeed, and nothing further was done. The process, according to the history obtainable, was at this time a month old, and the thigh had been immensely swollen for some time. A radiograph showed a thickened periosteum, extending almost the entire length of the shaft. The child was up and around in two weeks after the liberation of pus, and in three months thereafter she discarded her crutches. There has not been for some time any discharge. The sinuses are all healed, and the radiograph three months after the operation, although still showing some periosteal thickening, does not show any sequestrum. The trabecular arrangement of the lower end is fairly good, although there are several areas where it is lacking. Probably these are cavities containing granulation tissue. The femur in Case one (Figs. 4–5) shows pretty nearly the same conditions.

It seems most probable, that where the process has caused a demonstrable change in the periosteum covering almost the entire shaft, the medulla was infected to a corresponding extent. If so, the regeneration of the medulla must be very active indeed. In the metaphyseal region, the medullary tissue is contained in the cancellous spaces bounded by the trabeculæ, and the destructive and reparative processes become more complicated because of the presence of these bony trabeculæ. Drainage is more complicated than in the medullary canal, and minute sequestra are formed, which have to be removed or melt away. The cortex is here thinner.

The cases here reported emphasize the remarks made at the beginning of this paper regarding the variability in destructiveness of the osteomyelitic process, and show the necessity for careful combined clinical and radiographic study of individual cases.

The radiographic shadow is sometimes easy of interpretation, and sometimes very difficult. The observation of the course of destruction, followed by that of repair in a certain number of cases, helps us materially in the interpretation of the variable pictures presented by the process in all of its phases. The surgeon will very often have to deal with trouble at a time when regenerative processes have made it difficult to distinguish in the radiograph the meaning of the shadow, unless he can read into it a knowledge of destructive and reconstructive processes. The keynote to the wisest treatment in the long run is an intimate knowledge of this variability of destruction and of the possibilities of repair, leading us to a not too aggressive assistance or to operative activity in selected cases.

The difference in bone structure in the young is in their favor, as influencing the process of destruction and repair.

According to Schuchardt, the ground substance of their bones is composed of a network of coarse bundles of fibrils. There is not the same lamellar system as in the adult. The entire bone is more vascular, numerous Haversian canals are more loosely filled, and allow in inflammatory processes a filling in with new vessels.

On account of this greater vascularity, coupled with a more fibrillar ground substance, the bones of the young act more like the soft tissues, consequently sequestrum formation is more common, and these, when formed, are removed by nature more readily. Regeneration is more active. The more radical operations will thus be called for only in the most destructive types of the disease.

LITERATURE

The history and literature of osteomyelitis and of bone regeneration is given in Schuchardt's "Die Krankheiten der Knochen und Gelenke," Deutsche Chirurgie, Lieferung 28; Lossen's "Resection derK ochen und Gelenke," Deutsche Chirurgie, Lieferung 29b; Marchand's "Der Process der Wundheilung."

HOUR OF BIRTH[1]

A Discussion as to the Hour at Which Birth Most Often Occurs

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THE majority of obstetrical treatises which refer to this subject state that birth usually occurs at night, and most commonly takes place at 3 o'clock A. M., and with this simple statement the subject is generally dismissed. In the text-books which enter farther into this matter, we most frequently find the diction which is commonly, but erroneously, credited to Spiegelberg. "Labor usually begins in the evening, most often between 9 and 12 P. M., terminates generally in the night, the maximum number of births occurring between 12 and 3 A. M." Moreover, some authors, as Jewett, quote Spiegelberg to the effect that "the end of labor occurs twice as often between 9 P. M. and 9 A. M. as in the other twelve hours. There is little wonder then that this idea has become prevalent among the laity, medical students and majority of general practitioners.

Yet if we turn our attention to even a theoretical consideration of this subject, we find it difficult to believe in the truth of the prevailing idea. There are so many variable factors in ovulation, insemination, pregnancy, and labor, that it is difficult to believe that they can be timed to such a nicety as to result in the birth of the majority of cases at any one hour of the day.

At the present time we believe that ovulation occurs independently of menstruation, and although many, as Leopold, Zweifel, and others, hold in its physiological periodicity for individuals, our knowledge of the histology and physiology of the ovary scarcely warrants us in believing that the ovum periodically escapes from the follicle at a certain definite and fixed moment, in each individual. Unfortunately our knowledge concerning the ripening of the human ovum is scanty; nor do we know the limit of time the spermatozoa retain their activity in the female generative tract, or the ripened ovum resist the entrance of the male element. We are ignorant, moreover, of the place of fertilization of the ovum in any given case, and if fertilized about the ovary or in the tube, do not know how long it may take for the egg to reach the uterine cavity. Yet it does not seem logical in the light of observations of other physiological phenomena, such as menstruation, lactation, etc., to assume that the combination of the factors essential for fertilization is ordained to take place within any one group of hours rather than another.

Although we are unable to accurately determine the duration of pregnancy, we may conclude from clinical studies that it presents considerable variations. The calculation of the time elapsing between a single coitus and labor has done little more than emphasize this fact. Thus, Duncan analyzed 46 such cases and found the average of the periods to be 275 days. Faye in 63 cases found it to be 270.6 days. Löwenhardt in 578 cases found it 272.2 days. Ahlfeld in 425 cases obtained an average of 271 days, but called attention to the fact that there was a difference of 99 days between the longest and shortest periods. Hecker in 108 cases figured an average of 273.5 days, with a difference between the longest and shortest period of 63 days. Veit in 43 cases showed an average of 276.4 days, with a difference between the extreme periods of the series of 36 days.

In the breeding of domestic animals in which conception as a rule follows a single act of sexual congress, similar variations have been noted by Tessier, Krahmer, Spencer, and others. Thus the average duration of gestation in rabbits is 31 days, the variation 8 days; in sheep an average of 151 days, with a variation of 26 days; in cows the average gestation is 283 days, but calving may occur between the 183d and 356th day; in mares the average period is 347 days, but foaling may occur between the 287th and 419th day.

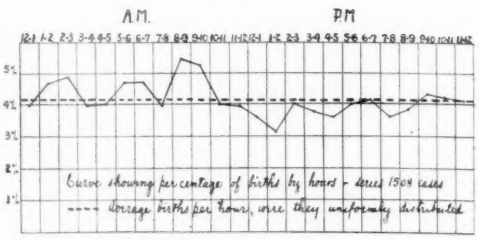
[1] Read at the May meeting of the Chicago Gynecological Society.

Many authors believe that various factors may influence the duration of pregnancy in the human species. Thus statistics have been adduced to show that the period of pregnancy is shorter in the earlier and later reproductive periods than in the middle period. Issmer states that the duration increases with each full term pregnancy up to the ninth, after which there is a decrease. He also claims that the average duration is greater in strong women than in weak. Others have adduced evidence to show that it is longer in those who rest a great deal during pregnancy than those who do muscular work. Moreover it would appear that pregnancy is habitually longer or shorter in some women than the accepted average.

We find also variations in the duration of labor, and although we are ignorant of the cause of the onset of labor, there is little proof that labor is most apt to begin at any one period of the day. We know that the labors of the same individual vary greatly in duration and character, and various statistics show that birth may occur at practically any time between 30 minutes and 70 hours following the first painful uterine contraction. It is clear, therefore, that in the theoretical consideration of our subject we are concerned with a number of extremely variable factors, and it is difficult to believe that they are so correlated by nature to result in a majority of births at any one hour of the day.

In 1903, while analyzing the labors of a series of cases in the obstetrical wards of the Johns Hopkins Hospital, we turned our attention to this subject and tabulated the hour of birth in 1,508 full term spontaneous labors. I am indebted to Prof. Williams for permission to use these cases.

The greatest number of births in this series occurred between 8 and 9 A. M.=82 cases (5.44% of total, or 1.27% more than 1/24th of the series); the least number are recorded between 1 and 2 P. M.=47 cases (3.11% or 1% less than 1/24th of the total). We think that undue importance should not be attributed to this fact, on account of the limited number of cases of our series giving unduly high percentage for each case, and especially because in 12 different hours the birth rate corresponded



to within 2% of 1/24th of the total number of cases.

TABLE I.

HOURS OF DAY WHEN DELIVERY TOOK PLACE IN 1,508 CASES

Between				Cases	% of Total
12 and	1	A. M.		60	3.98
1	" 2			70	4.64
2	" 3			74	4.9
3	" 4			59	3.98
4	" 5			61	4
5	" 6			71	4.7
6	" 7			71	4.7
7	" 8			60	3.98
8	" 9			82	5.44
9	" 10			79	5.24
10	" 11			61	4
11	" 12			59	3.98
12	" 1	P. M.		54	3.6
1	" 2			47	3.11
2	" 3			61	4
3	" 4			57	3.78
4	" 5			54	3.6
5	" 6			61	4
6	" 7			63	4.17
7	" 8			54	3.6
8	" 9			58	3.84
9	" 10			65	4.31
10	" 11			64	4.24
11	" 12			63	4.17

Six hours are credited with more than $\frac{1}{4}$ of 1% of what would be the average rate per hour if the births were absolutely evenly distributed. Four of these are in the hours of night usually devoted to sleep. Six hours are credited with less than $\frac{1}{4}$ of 1% of 1/24th of the total cases. One of these is an hour in which the average man is in sleep.

If we divide the day into three periods of eight hours each, we find that 1.3% more cases than its quota of $33\frac{1}{3}$% were born within the hours which are customarily observed for sleep.

From this will be seen that birth in this series was fairly evenly divided in the various periods,

but that from 2 to 6% more cases were born in the so-called night division than the day. The greatest variation is seen in the last division which we have made for purpose of comparison with Jewett's quotation of Spiegelberg, that "the end of labor occurs twice as often between 9 P. M. and 9 A. M. as in the other 12 hours." This division presents the greatest variation in our series, 6%, or 3% more than half the cases, being born within the 12 hours from 9 P. M. to 9 A. M.

TABLE II.

CASES BY HOURS ARRANGED IN ORDER OF FREQUENCY

		Cases	Per Cent
Less than 50 cases per hour	1 P. M.	47	3.11
Between 51 and 55 cases per hour	12 M.	54	3.6
	4 P. M.	54	3.6
	7 P. M.	54	3.6
Between 56 and 60 cases per hour	3 P. M.	57	3.78
	8 P. M.	58	3.84
	2 A. M.	59	3.91
	11 A. M.	59	3.91
	7 A. M.	60	3.98
	12 P. M.	60	3.98
Between 61 and 65 cases per hour	3 A. M.	61	4
	10 P. M.	61	4
	2 P. M.	61	4
	5 P. M.	61	4
	6 P. M.	63	4.17
	11 P. M.	63	4.17
	10 P. M.	64	4.24
	9 P. M.	65	4.31
Between 66 and 70 cases per hour	1 A. M.	70	4.64
Between 71 and 75 cases per hour	5 A. M.	71	4.7
	6 A. M.	71	4.7
	2 A. M.	74	4.9
Between 76 and 80 cases per hour	9 A. M.	79	5.24
More than 81 cases per hour	8 A. M.	82	5.44

1,508 BIRTHS IN 8-HOUR GROUPING:

	Cases	Per Cent
Between 10 P. M. and 6 A. M.	522	34.6
6 A. M. " 2 P. M.	513	34.
2 P. M. " 10 P. M.	473	31.4

Dividing the day into two periods of 12 hours each, we find the following:

1,508 BIRTHS

	Cases	Per Cent
Between 7 A. M. and 7 P. M.	738	49
7 P. M. " 7 A. M.	770	51
Between 8 A. M. and 8 P. M.	752	48.6
8 P. M. " 8 A. M.	756	51.4
Between 9 A. M. and 9 P. M.	708	47
9 P. M. " 9 A. M.	800	53

When we turn to the literature we find to our astonishment that its greatest part has been on record for some 50 years, and consequently has been available for obstetrical text-books. Veit's series considers the greatest number of cases, embracing 14,036 records. He found the greatest number of births within any one hour in his series occurred about 1 o'clock A. M. and was 698 cases or 4.9 per cent, i. e., .73 per cent more than 1/24th of the total; the least number were observed about 5 P.M.= 507 cases, 3.6 per cent, or .57 per cent less than 1/24th of the total. There were 6,653 births between 7 A.M. and 7 P.M., or 47.4 per cent of the total; in contrast with 7,383 cases, 52.6 per cent, in the night hours between 7 P.M. and 7 A.M., showing that 2.6 per cent more than one half of the cases were born within this period.

White's report of recent date (1905) includes 4,000 cases, but is not arranged according to hours, and consequently is not available for detail study. He, however, groups his cases between 8 A.M. and 8 P.M. and found that 1,979 cases or 49.4 per cent were born between the day hours in contrast with 2,021 or 50.5 per cent delivered in the night, a variation of but .6 per cent from an equal division. White's table of 8-hour periods is interesting in comparison with ours, the slighter variation from the average of 33⅓ per cent being due doubtless to his greater number of cases.

Periods	No. of Cases (White)	Per Cent	No. of Cases (Author)	Per Cent
10 P. M. to 6 A. M.	1,391	34.7	522	34.6
6 A. M. to 2 P. M.	1,308	32.7	513	34.
2 P. M. to 10 P. M.	1,301	32.5	473	31.4

Berlinski recorded 809 births. The greatest number per hour was observed about 4 A.M. and 1 P.M., each 44 cases, 4.9 per cent or .73 per cent more than 1/24th of the total. The least number per hour occurred about 7 A.M. and 8 P.M., each 27 cases, 3.33 per cent, or .8 per cent less than the mean average per hour. Between the night hours of 7 P.M. and 7 A.M. were delivered 51.4 per cent as apposed to 48.6 per cent born during the day.

Thus we see that the hour of the day which presents the highest birth rate varies in different statistics.

Continuing these series, we find for 16,353 cases a number of 798 cases between 1 A.M. to

2 A.M.=4.8, or .6 more than 1/24 of total, and 593 cases cases from 5 P.M. to 6 P.M.=3.6 or .6 less than 1/24 of total.

GREATEST AND LEAST NUMBER OF BIRTHS AT ONE HOUR

Observer	Total No. of Cases of Series	Greatest No. Between	Per Cent of Total	Least No. Between	Per Cent of Total
Veit	14,036	1 to 2 A.M.	4.9	5 to 6 P.M.	3.6
Berlinski	809	4 to 5 A.M. / 1 to 2 P.M.	4.9	7 to 8 A.M. / 8 to 9 P.M.	3.33
Lynch	1,508	8 to 9 A.M.	5.4	1 to 2 P.M.	3.11

There is, however, a fairly constant per cent of increased birth rate during the night hours of 7 P.M. and 7 A.M. Thus we find the rate to be:

	Cases	Per Cent	Born Between
Veit	14,036	52.6	7 P.M. and 7 A.M.
Berlinski	809	51.4	7 P.M. and 7 A.M.
Lynch	1,508	51	7 P.M. and 7 A.M.
White	4,000	50.5	8 P.M. and 8 A.M.

Recasting these 20,353 cases to conform to White's period of 8 P.M. and 8 A.M., we find 2 per cent more than 50 per cent were born during the 12 hours which include the night (10,653 to 9,700).

We find in the literature records of nearly 23,000 labors classified roughly according to the hour of birth.

TABLE SHOWING HOURS OF BIRTH IN 22,837 CASES

	A.M.				P.M.				
	12–3	3–6	6–9	9–12	12–3	3–6	6–9	9–12	
Veit and Berlinski	2,164	1,956	1,925	1,744	1,709	1,668	1,713	1,966	14,845
Quetelet	445	353	290	315	279	295	351	343	2,680
Buck	150	131	141	90	101	76	101	138	931
Ranken	137	129	119	85	97	88	117	118	890
West	266	302	277	267	218	185	231	273	2,019
Lynch	203	202	221	184	165	178	177	187	1,508
	3,374	3,073	2,982	2,684	2,369	2,484	2,690	3,025	22,873

All combinations have been attempted with these figures, and the result obtained shows that from 1.5 per cent to 3.5 per cent more than half of the cases were born during any 12 hours which contain the night hours.

The following conclusions may be drawn from the above tables:

1. That the birth rate per hour is fairly uniform in a large series of cases.

2. The extreme variations between the birth rate per hour for any 2 hours is 1.2 per cent of total.

3. That in 12 of the 24 hours the extreme variation is less than ½ of 1 per cent.

4. That more births occur in the total hours of the night than any equal number of hours of the day, but the extreme variations in any such combination is less than 7 per cent.

5. Four per cent more births occurred between 7 P.M. and 7 A.M. than in the other 12 hours in 16,353 collected cases. The same variation occurs in 20,353 cases between 8 P.M. and 8 A.M., and 8 A.M. and 8 P.M.

6. That the statements made on this subject in many text-books are incomplete and erroneous.

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CARL BECK, M. D.

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

THE ROENTGEN METHOD IN THE SURGERY OF THE CHEST [1]

By CARL BECK, M. D.
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SINCE the Roentgen method has in so miraculous a manner perfected our diagnostic means, thoracic surgery entered a new phase. While the physical methods of examining the chest are so far developed that they give us a great amount of most valuable information, there are still many instances in which the surgeon would not trust them as a reliable guide for planning an operation. Especially the difficulty of localization, causing that painful feeling of uncertainty, made the same surgeon who knew of no more technical difficulties in the abdominal sphere, extremely timid when surgical interference in the thorax seemed to be indicated.

Thanks to the wonderful rays, this sad era belongs to the past now. Foreign bodies, abscess of the lungs, bronchectatic cavities, echinococcus cysts, and gangrenous foci can be recognized and localized so that they become directly accessible to the surgical knife.

It is not the purpose of this paper to enter the details of the Roentgen technics, as I have described them extensively in my text book on "Roentgen Ray Diagnosis and Therapy", but I desire to emphasize a few points from a strictly surgical point of view, which at the present time, at least, do not find the appreciation they deserve.

In the first place, I wish to emphasize that the screen is most valuable in the examination of the thorax in general, especially from a medical standpoint, since it permits of the observation of organs while they are in continuous motion. The number, rythm and shape of the various motions can be distinctly studied. In regard to the study of diseases of the lungs by the Roentgen method, it may be maintained that whoever does not master the principles of auscultation and percussion is not fit to comprehend the fluoroscopic or skiagraphic signs. There are conditions in these organs that can be better elicited by the so-called physical methods, and others that can be ascertained only by means of the Roentgen rays. While the rays show small tumors or infiltrated foci which, on account of their central location, cannot be diagnosticated by the physical

[1] Read by invitation before the Nicholas Senn Club, Chicago, February 16, 1907.

Fig. 1. Small longitudinal remnant of gangrenous focus two months after radical operation.

methods, they have the disadvantage of always showing the thoracic image *in toto;* that is, they represent all the shadows of the tissue situated before, as well as behind, the diseased area at the same time.

The early stage of tuberculosis of the lungs, solidification, and atelectasis, as well as exudation and calcification, can be well represented by the rays. The infiltrated walls of cavities are recognized as more or less distinct shadows surrounding a light area. The true nature of the various shadows is often better understood if, after previous skiagraphic representation, the thorax is also fluoroscoped in different positions. In that case we *see* the area, which produces bronchial breathing, so to say, instead of auscultating it.

The most conspicuous manner in which the Roentgen method shows its importance, is by the representation of foreign bodies in the respiratory passages. In many instances, as we well know, the symptoms of their presence has not become marked in the beginning, so that if the anamnesis is not relia-

ble, doubts as to the correctness of the diagnosis may arise. These doubts are at once removed by resorting to the aid of the Roentgen method, and it is, in fact, a crime to endeavor to ascertain the fact by further expectant procrastination, which means nothing less than death for the unfortunate patient. Foreign bodies always cause grave symptoms sooner of later, and they should therefore be extracted at the earliest possible moment. So far there is only one case known in literature, in which the aspirated fragment of a broken tracheal canula became encysted, after having caused severe symptoms for two months (Blumenthal).

According to Hoffmann (Nothnagel's Special Pathology and Therapy) a foreign body should be thought of, when there is:

1. Circumscribed broncho-pneumonia and bronchectasis in the right lower lobe.
2. When there are signs of abscess-formation without apparent cause.
3. When aged people present signs of peculiar somnolence, while the respiratory tract shows signs of disturbance.

Reports show that many times there are grave symptoms in the beginning, which disappear again, until years afterwards gangrene or lung-abscess begins to form.

The treatment is either bloodless or operative. The bloodless methods are: Administration of emetics, preferably by subcutaneous injections of the muriate of apomorphine; special positions and manipulations; or extraction of the foreign body under the guidance of the bronchoscope. The operative methods are: Inferior tracheotomy; intrathoracic tracheotomy above the bifurcation; bronchotomy from the posterior mediastinum, and pneumo-bronchotomy.

As to special positions, it may be said that an effort can be made to dislodge the body by strapping the patient, especially if he be an adult, to a swinging platform, tilted head downwards. The head may reach the floor. Forced expiration should be advised, while inspiration must be done slowly and superficially. These procedures have a slight chance of success as long as the foreign body is still movable.

The bronchoscope was introduced into practice especially by the untiring efforts of Killian, and has proved to be of great value. In a number of cases, fragments of bones, fish-bones, buttons, beans, etc., were removed under its guidance, without resorting to tracheotomy. Of course, the procedure must always be preceded by skiagraphic localization. The technique of this new method is rather difficult, and should be practised by an expert only.

When the bloodless methods fail, inferior tracheotomy must be performed without delay. If the foreigh body was movable the chances are that it is ejected as soon as the trachea is opened.

When the foreign body has become anchored, it must be loosened by the aid of suitable forceps under the control of the bronchoscope, which is to be introduced through the tracheal wound.

When it is found that the foreign body cannot be extracted by these manipulations, access must be gained by intrathoracic tracheotomy or thoracotomy. Intrathoracic tracheotomy is performed by exposing the trachea as far down as to the crossing of the innominate vein. This is best done by extending the tracheotomy-wound down to the ensiform process, and dividing the sternum by a saw in the median line, after the vein is pushed aside. Then the trachea is seized with a strong-holding forceps, and pulled upwards so that the bifurcation is made accessible. This procedure is very risky, however, and always followed by mediastinitis.

Thoracotomy is far more preferable. After the foreign body is localized by the Roentgen method, three rib-portions are resected above the area, after the exploratory operation-principle. The further procedures are done according to the rules described further down in connection with the operation for abscess of the lung.

If great haste is not required, some prefer to produce pleural adhesions first, by the application of a paste of chloride of zinc. For further proceeding into the lung-tissue, Paquelin's cautery should be given the preference. Sometimes the foreign body is felt by introducing an aspiratory needle, slight manipulations sufficing to dislodge it, so that a cough-attack is apt to expectorate it.

In the case of procrastination, it is less the foreign body which troubles the surgeon than its consequences, viz., bronchiectasis, abscess, or gangrene.

Compression of the trachea is often the result of foreign bodies in the œsophagus, the direct consequences being dyspnœa. This would necessitate tracheotomy as long as the efforts at extraction should be unsuccessful at the time. Septic bronchitis, pneumonia, and pleuritis may be responsible for the fatal outcome in an indirect way. Sharp bodies may produce perforation of the trachea and hemorrhage from an injured vessel.

In regard to lung-abscess, it may be said that its diagnosis is made by the presence of copious purulent expectoration, its admixture of elastic fibres and blood-pigment, the history of a preceding inflammatory process, particularly of pneumonia, which has run no typical course, the physical signs of the presence of a cavity, and the absence of tuberculous manifestations especially absence of the bacillus tuberculosis in the sputum.

As to localization, it must be borne in mind, that while cavities of the apex contain more or less air, those situated farther below show purulent secretion only. If in the latter variety expectoration is copious, so that the cavity becomes evacuated, the respiratory sounds become tympanitic on percussion, and are well perceptible on auscultation. If, on the contrary, the cavity is filled up, there is complete dullness, and the respiratory sounds are hardly, if at all, audible, pectoral fremitus also being absent. Cavities of recent origin are more easily localized than old cases, not only because the course of the precursory disease furnished clearer information, but also because the physical symptoms are much more pronounced. Old cavities are, with few excep-

tions, deeply situated, and can generally be reached below the lower angle of the scapula.

Exploratory puncture, while reliable in pyothorax, often fails to disclose lung abscess, and is therefore to be replaced by exploratory pleurotomy or pneumotomy.

The treatment of lung abscess is governed by the same principles as those applying to any case of abscess; that is, thorough evacuation and drainage. This can be done only by making a wide opening in the chest-wall. To accomplish this the resection of at least two ribs is required.

The technique is as follows: Thorough asepsis is just as necessary as in any other operation, and is practised after common general principles of wound treatment. As a rule, the eighth rib is selected for resection first. The skin-incision, about five inches in length, should be made in the centre of the selected area and carried down to the periosteum of the rib. After the rib is freed from its periosteum by the aid of a periosteotome, a portion of the rib, not less than four inches in length, is removed by a rib-shears. Then the same is done with the rib above and eventually below. Now the costal pleura is incised, and a large aneurysm needle introduced through the pleural incision and conducted underneath the costal pleura to another pleural incision. With strong silk sutures the tissues containing fascia, muscle, periosteum, costal pleura and intercostal arteries, are ligated close to the surface of the rib. Then a vertical incision is made through the tissues between the two ligatures, thus creating a wide opening. By retracting the wound-margins forcibly, the skin incision can be utilized for the resection of the rib above, as mentioned. If, as rarely occurs in these cases, adhesions should be absent, the lung may collapse, so that it is found impossible to draw it forward, in which event the final incision has to be deferred for a day or more. When the lung moves freely beneath, it is essential to shut off the pleura by packing gauze tampons around the margins, in order to prevent infection from the escaping pus. As a rule, this procedure renders suturing of the pleura to the lung unnecessary, as well at the artificial formation of adhesions by the use of caustics. It the abscess is located superficially, infection of the pleural cavity might also be caused by the stitch canals.

The further steps must be taken with great care and patience. Should palpation of the pulmonary area have failed to give information, an exploratory needle of moderate size may be slowly pushed into the lung. If necessary, this must be repeated at different points. Should the focus not be reached by the needle, the pulmonary pleura must be carefully divided and the thin, slightly red-heated point of a Paquelin cautery thrust into the suspected portion. It is advisable to use a thin director, made of platinum, which fits round the heated platinum tip of the Paquelin cautery, just as a stylet fits to a trocar. After the tip and encircling director have perforated the lung tissue, the tip is withdrawn and the director left *in situ* to ascertain whether any pus appears at the groove of the director. If so, a small artery-forceps is

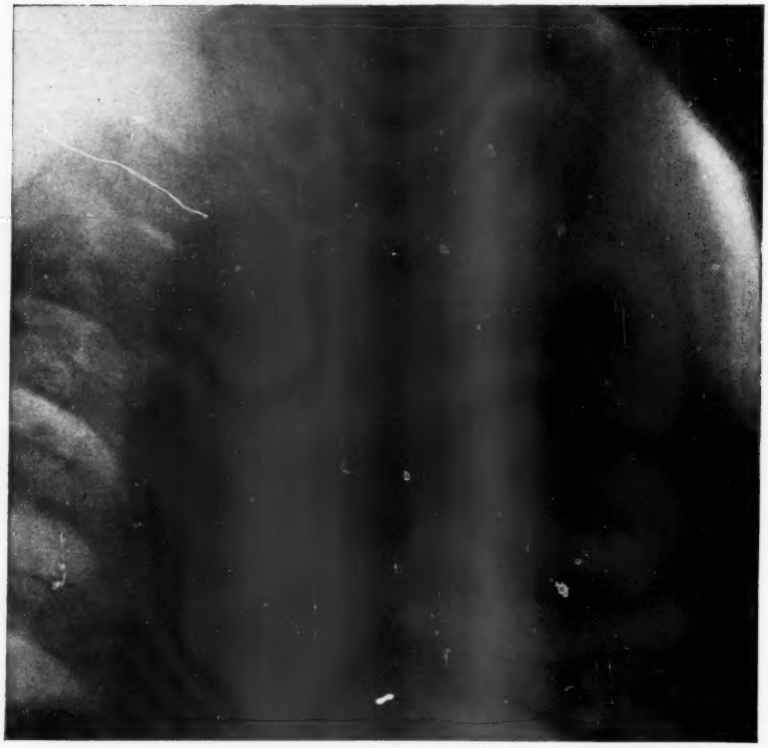

Fig. 2. Posterior reproduction of œsophageal carcinoma extending to the left on a level with the second, third, and fourth dorsal vertebræ: bismuth-bolus above at the entrance to the stricture (taken with the author's diaphragm).

introduced and the opening gently dilated. The great advantage of the Paquelin cautery is its preventing infection, while the exploratory needle is apt to cause it.

In those cases where, after exploratory resection, the costal pleura appears to be especially thin, and where at the same time no adhesions are present, the membranes not being immobilized by adhesion-formation, pneumothorax may form as soon as the pleural sac is opened. Then the opening must either be packed quickly or the pleuræ sewed together. The Sauerbruch cabinet may be of value, however. In one of my cases the lung collapsed as soon as the pleura was incised, the patient becoming cyanotic, the respiration shallow, and the pulse imperceptible. He was virtually given up, but after thorough

packing with sterile gauze and the administration of stimulants, he rallied. Although it seemed desirable to defer pneumotomy for a few days, the condition of the patient was so bad that the opening of a large gangrenous focus was undertaken on the following day. But the patient succumbed to sepsis.

The pleural suture should be rather extensive, the underlying pulmonal tissue to be seized as well at the soft tissues in the wound of the chest-wall. Sometimes the pulmonal tissues are brittle, so that the stitches may tear. To stop up the puncture holes, Tiegel[1] saturated the silk sutures with iron chlorid, thus utilizing the coagulation of the blood. The same author recommended to place two 'scaffold threads' deep in the lung, one on each side of the incision and parallel to the surfaces which were expected to be approximated. These sutures were then passed around these and knotted. Tiegel claims that tearing of the pulmonal tissue, even when brittle, was obviated.

After the cavity is exposed, no irrigation or exploration with the finger is advisable, since procedures of this kind might provoke hemorrhage. A narrow strip of iodoform-gauze is carefully introduced into the cavity. The whole is then once more thoroughly cleaned, examined and packed with iodoform-gauze, and finally protected by a large piece of moss-board. The dressing need not be changed more frequently than every second or third day, unless there should be signs of retention of pus. It is advisable to tell the patient to

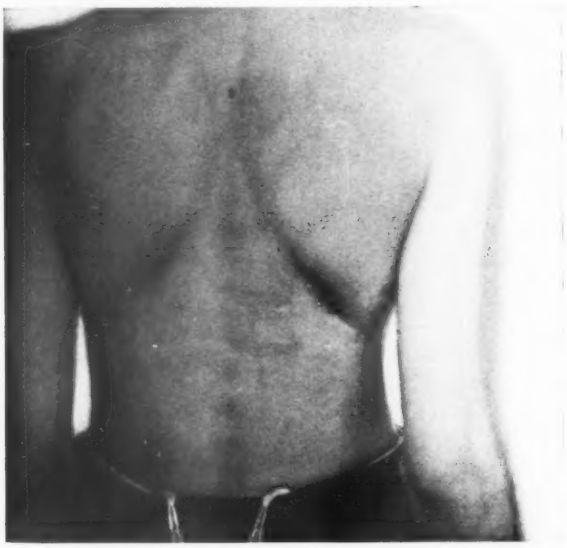

Fig. 3. Photograph of patient illustrated by Roentgenograph, Fig. 4, showing inversion of the diseased side, two months after operation.

Fig. 4. Focus of lung abscess two weeks after operation.

blow at intervals with his mouth and nostrils closed, which helps to evacuate the purulent discharge.

The patient should get up after a few days if possible. During the early period of the after-treatment small doses of morphine are administered for the purpose of immobilization, especially when cough is present. If the pulse be weak, strophanthus and caffeine may be added. Nourishment must be given frequently and in small quantities at a time.

Anæsthetics should be used only if the pulse be strong enough, which in most cases of lung abscess must be regarded as an exceptional circumstance. Ether being contra-indicated in respiratory disturbance, only chloroform can be employed; and attention needs not be called to the danger to which the use of this paralyzing drug subjects the heart. Since, for a well-trained surgeon, the operation does not take very long, it would be better to use ethyl chloride or Schleich's infiltration method, and also to administer a morphine injection before the operation. If chloroform is employed, only a few drops should be poured into the mask at a time, and the pulse, the respiration, and the color of the face be carefully watched. If a general anæsthetic be employed at all, which facilitates matters, I prefer ether in spite of its disadvantages.

Gangrene of the lungs is primarily due to invasion of saprophytic bacteria into the lungs. They gain access either by being suspended in foreign bodies of an organic nature, like food particles, directly, or by entering later, after the foreign body has settled there. It is self-understood that patients afflicted with inflammatory or ulcerating processes in the mouth, pharynx, or larynx are especially inclined to the aspiration of decomposing elements. The same applies to carcinoma of the tongue, pharynx, larynx, œsophagus, and stomach. Fractures of the mandible which are not well immobilized, and where the oral cavity is not kept clean in a most scrupulous manner, may also give the impetus to such a fatal complication.

The fact that patients emaciated by one of the precursory affections mentioned, also aged persons and alcoholics, are particularly liable to acquire pulmonal gangrene, is one of its most important features.

The secondary type of pulmonal gangrene is caused by pre-existing affections of the lungs, like fetid bronchitis. If in pneumonia, bronchiectasis, or pulmonal tuberculosis a new putrid infection takes place, gangrene may be caused in an indirect way. To necrotic decubitus, suppurating caries, puerperal processes, and similar conditions, gangrene of the lungs may also be due.

Pulmonal gangrene is most frequently found in the lower lobe, and especially on the right. Here it may be circumscribed as well as diffuse. There the pulmonal tissue has changed to a grayish-green mass, the odor of which is characteristically penetrating. (I saw some of my best nurses faint on account of this odor.)

It is especially the expectoration of the fetid secretion from such necrotic foci which points to the presence of pulmonal gangrene. The sputum is profuse, the daily amount being from 150 to 500 c. c. It contains various types

of bacteria. The pathognomonic proof is furnished by the presence of fragments of pulmonal parenchyma.

The prognosis of gangrene of the lungs, which was regarded as most unfavorable before the aseptic era, has materially changed for the better. It depends upon the ætiology of the various types, the embolic as well as the bronchiectatic form of gangrene being inauspicious. As long as the process is of a circumscribed nature the chances are naturally more favorable. The mortality of the present time shows 31 per cent, only in cases where radical pneumotomy was performed. This result would be still more favorable, would not, in the cases mentioned, a number of aggravating circumstances have co-existed, viz., multiple foci, bilateral gangrene, and association with embolic processes, inflammation, or abscess of the brain.

In order to be able to approach the cavity as directly as possible, extensive exploratory resection of the chest-wall should precede its exposure. This is so much more necessary as there are often small cavities grouped around a large one, which are more or less connected with the latter. It is self-understood that they must also be made accessible to direct surgical interference. All necrotic tissue must, of course, be completely removed and the cavity packed with iodoform-gauze. Irrigation must be used during the after-treatment, which is virtually the same as that of lung abscess.

I would also like to touch similar conditions, like echinococcus of the lungs and bronchiectasis, but this would exceed the limits of this paper. I may refer to my former publications on this subject therefore, stating however that the principles of localization by the Roentgen method are the same in principle, as will be seen further below.

On the operative treatment of tuberculosis of the lungs it may be said that the results for this most frequent of all diseases are yet far from being encouraging. Still there is a number of cases in which cures were effected. Surgical interference should therefore not be condemned as is frequently done. Of course, it should only be undertaken if there are circumscribed foci.

Sonnenburg demonstrated a patient before the German Surgical Society, who had recovered completely after the extirpation of a tuberculous focus in the lungs. J. Murphy reported 26 temporary cures among 47 patients operated upon in the same manner. Tuffier and Lawson published the most encouraging results, but other surgeons were less fortunate.

There are three drawbacks regarding the indications for the operation:

1. Its great danger.

2. The uncertainty of a detailed diagnosis, although the Roentgen rays give us much better chances now for localizing the foci.

3. The possibility of recovery by non-operative means.

In its incipient stage, the disease is often cured by medical, that is, by climatic, dietetic, and mechanotherapeutic, means, while in late stages, it has generally passed beyond the hope of benefit from operation.

The best results are obtained in cases of mixed infection where continuous

septic absorption is produced. There the stagnating contents of the cavity are promptly removed by drainage, and if the fever was due to the absorption, it disappears after further decomposition is thus prevented. Naturally the general condition improves accordingly. A fair result may also be obtained in those types of pulmonal tuberculosis where tissue-necrosis has not yet taken place, or where no such tendency exists.

The operation may also be indicated in case of excessive and repeated hemorrhage. The more radical extirpation of a tuberculous focus, as performed by Tuffier, is extremely dangerous; still once in a while such risky steps are followed by a cure. In one of his cases, Tuffier incised the pleura below the second rib and freed it from the ribs as far as he could, thus virtually establishing a pneumothorax outside of it. After having palpated the indurated focus in the apex, he opened the pleura and pulled the lung tissue forward with a large grasping forceps. Then he resected the whole portion. Drainage was omitted. The patient was shown in excellent condition at the Société de Chirurgie twelve days after the operation and was reported cured four years afterward. Recently Gluok resected the apex of a lung with success

Mobilization of the thoracic wall above the cavity and partial decortication of the pleuræ are most important adjuncts in the healing process, as they favor diminishing the extent of the cavity by the collapse of its indurated roof, thus also causing relaxation of the over-extended tissues, and thereby being relieved from the continuous straining due to the respiratory motions.

Regarding localization, the following points may be emphasized: As mentioned, to study relations, the screen offers the best chances, as it gives information about the mobility of the diaphragm and the degree of expansion. Thus during deep inspiration, it may be ascertained whether the dark shadow of a focus approaches the thoracic wall or is more centrally located, an area of normal lung-tissue being between them.

The size of the foci can be estimated best by stereoscopic exposures, while the photographic plate, in proportion to the different projections, gives different sizes. Such points are of great importance in all thoracic diseases except in pulmonal cavities, which must be approached by the surgical knife. There it is the question of localization only, which is of importance. Consequently the representation of the focus on the skiagraphic plate is the leading factor. We see, therefore, that for most surgical purposes the screen is of little practical value. Even if the shadow of the focus is so situated that in the ventral as well as in the dorsal position, it is overshadowed by the shadow of the heart, we are able by oblique irradiation to represent it. The tissue defects appear as light areas, with which the surrounding cavity walls contrast as dark shadows of an irregular circular or elliptic shape. It is evident, therefore, that the focus is not representable as such, but that it is recognized by its walls; in other words, by the area of pneumonic infiltration around it.

This infiltrated sphere is less translucent and its outlines define the greater

or lesser shadow in accordance with the greater or lesser degree of infiltration. Of course, if gangrenous fragments are situated in the cavity as loose sequestra, they also cast a dark shadow on the plate, but then they are recognized as such, inside of the focus.

The difference of the projection is determined by comparing the size of the focus in the ventral as well as in the dorsal position. Thus it is recognized whether the focus is nearer the dorsum or the anterior chest-wall. If the shadow shows in the abdominal position as well as it does in the dorsal, it must be centrally located.

In gangrene the gradual clearing up of the formerly solidified area can be observed. Similar views apply to echinococcus. (See "Echinococcus of the Lungs." Journal of the American Medical Association, November 19th, 1898.)

In cases of old standing, where the pleura became thickened, and particularly where pyothorax was one of the complications, the rib-resection should be most extensive, not only in order to permit of thorough inspection but also to favor collapse of the chest-wall. It is advisable in such cases to remove the periosteum almost entirely to avoid re-formation of osseous tissue, which, while desirable under ordinary circumstances, would prevent thorough agglutination in this peculiar instance. If a portion of the surrounding tissue has undergone such changes that its restoration becomes doubtful, it may be compressed by an elastic ligature, after being mobilized, and removed a few days thereafter.

The question whether there is only one focus is also determined by the skiagram. In order to get more detailed information it is advisable, therefore, to use the tubular diaphragm after a general view of the lungs is obtained. That area which shows the shadow on the large plate is marked and exposed through the diaphragm. By this procedure, an apparently diffuse process proves to be a conglomeration of a few gangrenous foci, generally a larger one surrounded by two or three smaller ones.

Even if the focus is overshadowed by a rib, the border of the focus will at least be shown if the diaphragm be used. The same applies to the old cases in which the thickened pleura veils the foci.

In previous years the presence of additional foci was assumed as soon as, after the opening of one focus, the symptoms of retention persisted, while the Roentgen method enables us now to recognize their presence at the time of the operation. And if the presence of an additional focus was overlooked, the cavity is made more conspicuous on the skiagraphic plate if it is filled with iodoform-gauze. There the extent of the drained cavity appears in contrast to the area which had not been reached. It is self-evident, that its relation to the accessible cavity also serves as a guide for the direction of our further procedures. Repeated skiagraphic examination will thus be a reliable control of the further course.

DEPARTMENT OF TECHNIQUE

REPORT OF A CASE OF OVARIAN CYST WITH TWISTED PEDICLE COMPLICATING PREGNANCY AND LABOR[1]

By EDWARD P. DAVIS

It is not my purpose to review the extensive literature of this subject, but to report a case which so happened that unusual opportunities were given to study the conditions under which this complication arises.

The patient, Mrs. Z., a Polish woman aged 32, was in her third pregnancy. She had been delivered by forceps by Dr. J. M. Fisher, I believe, the child dying soon after delivery from birth pressure. Her second pregnancy terminated in the Jefferson Maternity, where she was delivered by forceps by Dr. Stricker Coles, the child dying from birth pressure. In her third pregnancy she came again to the Maternity, both she and her husband desiring greatly a living child.

She is a short, slender, brunette woman, the pelvis measuring anterior superior spines 26½ cm.; crests 27; trochanters 30; right diagonal 22; left diagonal 21; external conjugate 18; circumference 82. The patient was admitted to the Maternity a few days before the expected date of labor, left the hospital, and came back in the first stage of labor. On examining the patient, the abdomen was abnormal in contour, the back of the child evidently on the left side, the head movable above the pelvic brim and an indistinct fullness upon the right side. This could not be positively made out, as the woman was restless and having pain. On vaginal examination, the head was transversely at the pelvic brim, not engaged and freely movable. Uterine contractions were vigorous and regular. When the patient first came to the hospital she was accompanied by her husband, and written permission was obtained from him to deliver the patient by any method which seemed most likely to save her life and that of her child.

Celiohysterotomy was accordingly performed. On opening the abdomen difficulty was experienced in turning out the uterus. Investigation showed a tumor of considerable size, at the right side of the uterus, and tumor and uterus were finally removed from the abdomen, when the tumor was found to be a cyst of the right ovary.

Sterile towels wrung out of hot sterile salt solution were placed over the intestines, the uterus was opened and the child extracted, the placenta and membranes removed and the uterus closed in the usual manner. The child weighed 5 pounds 15½ ounces, was 52 cm. long. The bi-parieta diameter of the head measured 10 cm.; the maximum 13½; the occipitomental 12; the suboccipitobregmatic 10, and the frontomental 9. The child speedily cried and showed usual vigor.

On examining the tumor it was found to be cystic, from the right ovary, and having the pedicle twisted three times from right to left. Both pedicle and tumor were very dark and deeply congested, although gangrene had not yet developed. The pedicle was untwisted, the tumor removed, the pedicle trimmed and ligated, and the abdomen closed without drainage. The tumor contained two cavities and was filled with a dark grumous fluid, and was as large as the head of an average fetus.

Mother and child made an uncomplicated recovery, and on leaving the hospital the uterus was anteverted, above the pelvic brim, the cervix backward, the pelvic floor and perineum in good condition. The wound healed, the skin edges slightly overlapping at some points.

The case illustrates the following points: The tendency of ovarian tumors to twist the pedicle during pregnancy is a fact familiar to obstetricians. There is no complete and adequate explanation of this, but it may be supposed that intermittent uterine contractions, the growth of the uterus which takes additional space in the abdomen, and the growth of the tumor, all contribute to bring about this result. The complication is inevitably fatal, unless the presence of the tumor is discovered and the tumor removed. The most dangerous thing which could happen to such a patient is to be delivered through the vagina, and especially if the delivery is accomplished by operative interference. Manipulation employed in such a case frequently bursts the tumor when its contents cause peritonitis; should this not occur, the twisted

[1] Read before the Philadelphia Obstetrical Society, October 3, 1907.

pedicle causes gangrene with septic infection. It is more than probable that some cases of supposed puerperal septic infection, thought to arise in the genital tract, are cases of gangrenous ovarian tumors complicating pregnancy. In the present instance, the patient owes her life to the fact that she was delivered by abdominal section. While the abdomen was abnormal in contour, we could not positively diagnosticate the presence of an abdominal tumor besides the uterus. Had she been delivered by version or forceps, she must within a short time have perished from sepsis from the gangrenous tumor. Her recovery is due to the fortunate circumstance that abdominal section was selected as the method of delivery. The tumor was sufficiently fluid and soft to accommodate itself to the abdominal cavity, and very probably its presence would not have been diagnosticated after the birth of the child.

Whenever it is possible to diagnosticate the presence of an abdominal or pelvic tumor complicating pregnancy, delivery by abdominal section is the safest procedure. In dealing with these cases the entire mass, if possible, should be turned out from the abdomen, the abdominal wall may be brought together temporarily by a few stitches, hot moist towels may be placed over the intestines, the uterus should first be emptied, and if the tumor is not uterine it should be closed in the usual manner. It is impossible to deal properly with the pedicle of a pelvic tumor while the uterus still contains the child, and hence the necessity for first reducing its size. In dealing with the pedicles of tumors in such cases, especial care should be taken to ligate them securely, as the tissues have been more or less stretched and there will be increased danger that the ligature may slip. Unless there is distinct evidence of gangrene or the formation of pus, the abdomen should be closed without drainage, a moderate quantity of salt solution being left within the abdominal cavity.

EXCISION OF THE RECTUM FOR CICATRICIAL STRICTURE, BY THE COMBINED METHOD, WITH PRESERVATION OF THE SPHINCTER[1]

By J. J. BUCHANAN, M. D., Pittsburg, Pennsylvania
Surgeon to Mercy and Columbia Hospitals

The treatment of well marked cicatricial stricture of the rectum by any means less radical than extirpation of the diseased part, results in failure to cure the condition, in permanent incontinence, or in death. Dilatation by bougies or expanding dilators, internal proctotomy and external proctotomy give only temporary relief; while the formation of an inguinal anus constitutes a permanent disability, to which it is hard to reconcile the patient.

Having determined to extirpate the diseased part of the rectum for stricture, the surgeon may decide on a resection from below, from above, or by the combined method, or he may prefer to amputate the bowel from below or to employ the combined method for this operation. He will decide on the method of operation according to the location and length of the stricture and the mobility of the bowel involved. If the strictured portion be low, short and movable, he will probably prefer to operate from below, and will select the vaginal or perineal route or will deliver and remove the diseased part through the dilated anus according to the method of Hartman (1), who performed the first

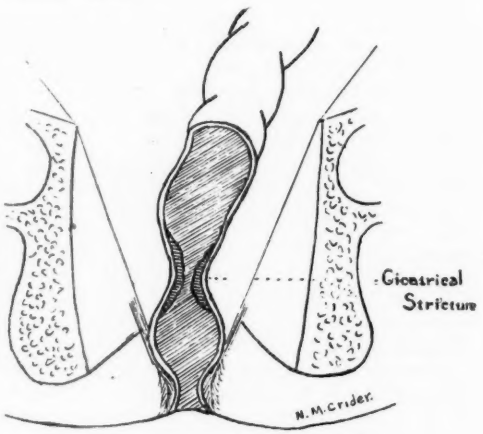

Fig. 1. Strictured rectum *in situ*.

[1] Paper read at Medical Society of State of Pennyslvania, September 26, 1907.

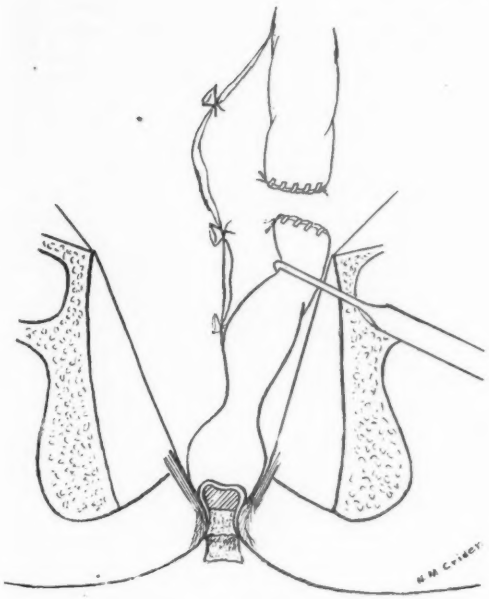

Fig. 2. Bowel severed at level of sacral promontory; ends closed. Lower segment completely released to bottom of pelvis. Upper segment released sufficiently to reach anus. Denudation one and a half inches upward from anus.

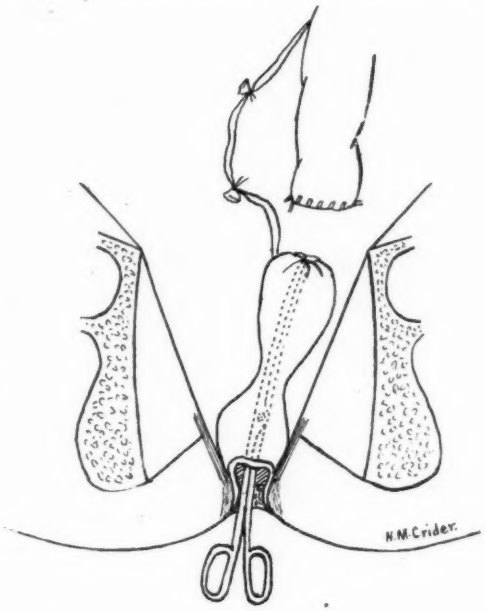

Fig. 3. Seizure of upper end of lower segment, after free posterior incision of the stricture from within.

operation of this kind on March 1, 1893. If the strictured portion be higher and the operation from below be impracticable by reason of its location or fixation, a combined operation may be performed, as was done in the author's case.

In such cases the operation of amputation of the rectum, complete or partial, with implantation of the cut extremity through the *sphincter ani*, denuded of its mucous coat, offers advantages not possessed by any other method.

1. The diseased portion of intestine is completely removed.

2. There is no suture of the intestine which could possibly result in a new stricture.

3. There is no possibility of fecal contamination from leakage.

4. Sphincteric control is almost or quite perfect.

This operation has been developed almost entirely by operations for malignant disease. The history of the combined methods of operation in which the removal of the rectum is accomplished by an anterior laparotomy and a lower incision at the same sitting, begins with the case of Czerny (2) (1883), in which, having begun the operation by the perineal route, and finding its completion thus impossible, he finished through an abdominal incision.

Maunsell (3) (1892) was the first to propose the deliberate combination of an upper and lower incision. He advised that the bowel be loosened from above, the diseased part invaginated through the dilated anus, the rectum resected outside and the suture line replaced within the sphincter.

Chaput (4) (August 27, 1894) combined the abdominal and sacral route, and Gaudier (5) (November 1895) the abdominal and perineal. The technique of the combined operation was so clearly defined by Quenu that its invention has been ascribed to him, although his first operation by this method was performed in 1896.

The invagination of the remaining stump of the bowel through the preserved sphincter and its circular fixation to the skin of the anus was first practiced in May, 1890, by Moulonguet (6), who, for carcinoma, removed with the growth all of the rectum below to the sphincter.

Hochenegg (7), in September, 1891, announced that he had abandoned the suture of the two ends of the resected rectum and was then invaginating the upper segment through the lower segment and suturing the cut end of the upper segment to the skin at the margin of the anus.

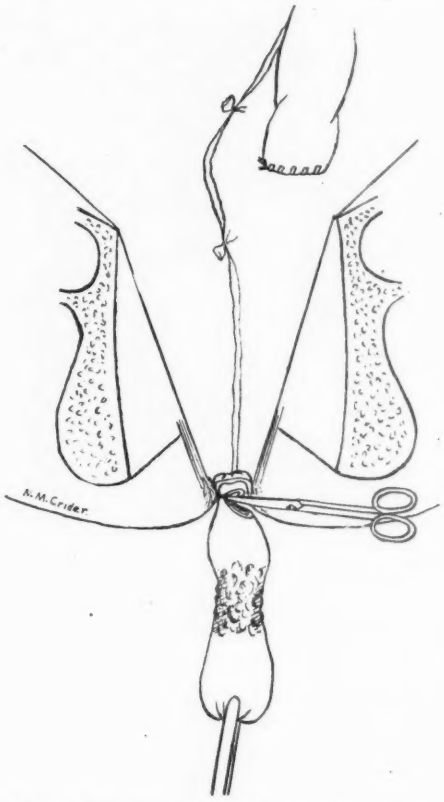

Fig. 4. Rectum turned inside-out and cut away at upper level of denuded part.

Schede advised the dissection of the mucous membrane from the lower segment.

It will thus be seen that the operation with which this paper is immediately concerned has been the outcome of the combined inventions of a number of surgeons.

To Moulonguet we are indebted for the preservation of the sphincter and the invagination through it and the implantation below it of the cut end of the upper segment; to Hochenegg, for the preservation of the lower segment to furnish a more stable invagination; to Schede for the denudation of the lower segment of its mucous membrane; to Maunsell for the combined method, which renders the rectum accessible at any height.

AUTHOR'S CASE. Patient admitted to Mercy Hospital, October 25, 1906. Married woman, aged 34, referred by Dr. Ira D. Knotts of Davistown, Pa.

Family History: Negative.

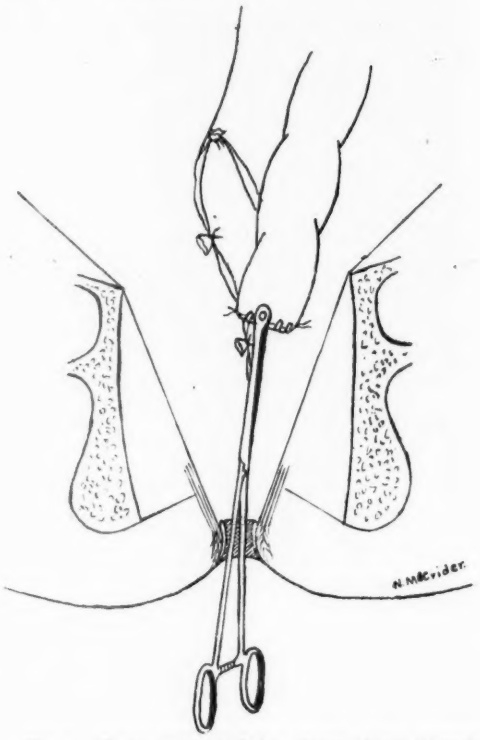

Fig. 5. Upper segment being drawn down through sphincter.

Personal History: Typhoid fever six years ago. Patient had one child fourteen years ago. Menstruation regular and normal.

Present Trouble began about four years ago, with pain in the rectum and abdomen, which has since that time, been almost continuous. She has had seven attacks of severe colicky pain in the abdomen, two of which occurred during the past summer. Severe pain in rectum on defecation. Bowels constipated and recently to the verge of obstruction. Patient has lost about thirty-eight pounds.

General Condition on Admission. Skin sallow. Heart and lungs negative. Pulse regular and of good volume. Urine examination negative.

Local Condition. Abdomen relaxed and without tenderness. Peristalsis normal. Digital examination of rectum shows a stricture about 2½ inches from the anus which will not admit the tip of the finger. Rectum movable.

Operation, October 31, 1906. Ether anesthesia. Trendelenburg position. Median incision. Intes-

tines packed off. Right Fallopian tube thickened; right ovary cystic and both ovary and tube much adherent to neighboring parts. Ovary and tube removed. Rectum well exposed and some perirectal adhesions found in Douglas' pouch. Bowel cut between clamps at level of sacral promontory. To prevent infection both cut ends were closed with Czerny-Lembert suture. Mesorectum separated on either side and peritoneum incised at its reflexion on the bowel below, and in front at the lowest possible point. The peritoneal surfaces of the mesosigmoid were then incised sufficiently to permit the proximal segment to reach the anus.

The patient was then placed in the lithotomy position, the anus dilated and the mucous membrane dissected from the bowel for a distance of about 1½ inches from the muco-cutaneous junction. Guided by the finger, a blunt knife was passed through the stricture, which was liberally incised posteriorly, to permit the distal segment to be completely delivered outside the body by drawing successive portions through the lumen of the part below. A long forceps was passed through the anus and rectum till the closed extremity of the distal segment was reached. By the aid of an assistant on the peritoneal side, the forceps was made to seize the closed end, and, by traction from below, the rectum was turned inside out and cut off just above the denuded portion. A long clean forceps was then introduced through the denuded anus, into the peritoneal cavity, and the peritoneal assistant placed within its grasp the closed stump of the sigmoid flexure, which was easily drawn through the denuded anus and fixed in place by circular suturing to the skin margin. A gauze drain was carried from Douglas' pouch through the lower angle of the abdominal wound, which was elsewhere closed with through and through sutures.

The original sutures which closed the stump of the sigmoid were left in place for twenty-four hours as an additional precaution against fecal contamination. They were removed at the end of this time and a rubber drain slipped into the new anal canal. Some bloody fluid accumulated in the pelvis after the operation, but escaped easily on the withdrawal of the suprapubic gauze drain on the third day.

The patient made a good recovery and returned to her home in five weeks. Her physician, Dr. Knotts, under date of July 11th, more than eight months after operation, reports that she is enjoying good health, that at night she has some leakage when the bowels are loose, but none through the day.

To the present time there have been recorded but two other cases of partial or total excision of the rectum for cicatricial stricture by the combined method, with preservation of the sphincter and implantation of the upper segment at the anal outlet.

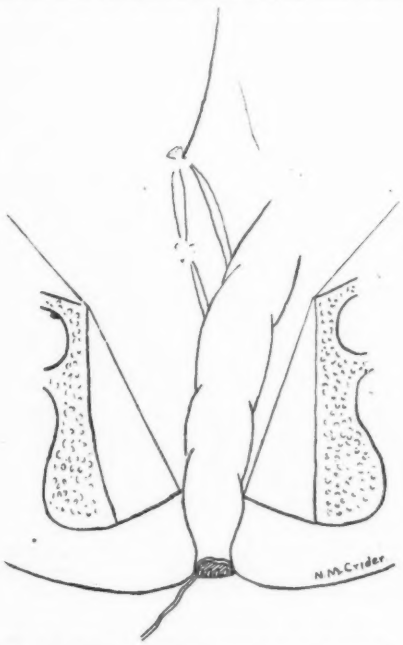

Fig. 6. Suture of upper segment to anal margin.

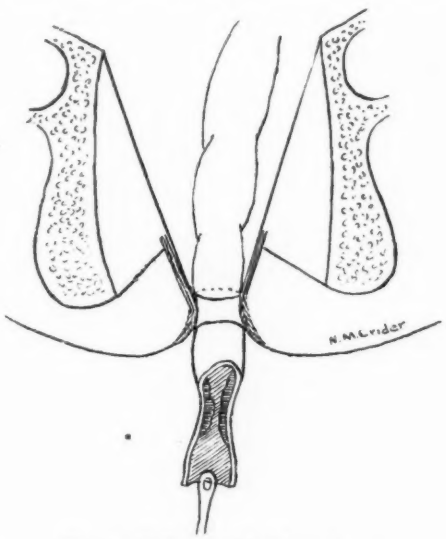

Fig. 7. Method used in Murray's case.

Blake (8), in 1903, freed the rectum and pelvic colon from above, incised the perineum from a point behind the sphincter to the coccyx. Through this lower incision the freed rectum was drawn, the strictured part resected. The lower segment was then denuded of its mucous membrane and the upper segment drawn through it and united to the muco-cutaneous junction. Drainage through the perineal wound.

Murray (9), in 1905, freed the rectum and pelvic colon from above, dilated the sphincter, dissected up the mucous membrane from the muco-cutaneous junction in cylindrical form for about an inch, at this level cut through all the coats of the rectum and separated it from its connections above till the freed portion was reached. He then drew the rectum out through the sphincter, amputated it and anchored the cut end to the skin at the anal margin.

The drawings which accompany this paper and illustrate the author's case are self-explanatory.

It will be noticed that the three implantation operations (Blake's, Murray's, and the author's) differ in method from each other. Each has its advantages, and only by experience in a number of cases could an operator decide among them.

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TRANSACTIONS OF SOCIETIES

REGULAR MEETING OF THE CHICAGO GYNECOLOGICAL SOCIETY
JUNE 21, 1907

DR. FRANK W. LYNCH, EDITOR

Dr. Rudolph Holmes, presiding.

EXHIBITION OF APPLIANCE

DR. HENRY BANGA: I wish to show you a case of mastitis which I have been treating for several weeks with suction. Although the patient is not cured yet, it is possible to judge of the advantage of this method. I saw the patient first four weeks ago, when she came with a swollen right breast, with a tender point in the lower quadrant. This is the quadrant with the infiltration in the inner half towards the axilla. I made a short incision here, you see it looks like a puncture. The cups were not large enough to cover the whole infiltrated area. I applied suction and drew out quite a quantity of pus followed by blood, put on a wet dressing, and asked the patient to come back the next day, when I again applied suction, getting perhaps half a teacupful of pus. The next day I applied suction and got just a little blood. The fourth day there was very little discharge. Meanwhile there was at least four fifths of the infiltration that I could not reach with the cup I had. I took in this area successively, when I had finished with one part, went further on, so that by three applications I felt that I had pumped over the entire infiltrated area. At first it caused a great deal of pain to apply the cup over the infiltrated spot, but while the cup was in position with the infiltrated tissue drawn into it, the patient stated that it did not hurt very much, and with each succeeding application there was less pain, the third time very little pain after she went home. She came the first time with excessive pain, such as patients have who suffer with mastitis. After the second or third day the pain ceased. About the fifth or sixth application I found in the middle of the mass a spot that had not fluctuated when the soft area developed, so I made an incision and found pus, then I applied suction as thoroughly as possible. Meanwhile another lump appeared, as large as a walnut. I covered this with the cups, and with about five applications it disappeared. A few days afterwards it appeared again for a few applications, then disappeared again. Then there was another lump here, a lump that seemed to be independent, so I took that also into the cup, and while it was very painful the first time, at the later treatments it was not at all painful. By feeling you can still recognize some infiltration, but it is not at all painful. She still nurses her child.

I have found the Bier method a most excellent way of treating these cases; it is the ideal treatment if the lump can be easily covered by the cup; the difficulty is to get cups that fit, and for that reason it is necessary to have quite a selection. The abscess may heal, the infiltration disappear and the wound close in about twelve days, as I have seen it in two cases. One advantage of this treatment is that it is not necessary to make a long incision. One day there was a case at the Michael Reese Hospital, and I entered the operating room just as Dr. Andrews was about to make an incision. I advised him to apply suction, and he was willing to try it. I told him an incision made from a surgical standpoint would be wrong, so he made a small incision and applied a suction cup, and in a short time the abscess was cured. The Doctor was surprised at the result and said he would not have considered it a correct surgical incision of a mammary abscess. Another advantage is that in some way the pains disappear very quickly. It would seem that drawing the infiltrated, inflammed tissue into a cup would hurt the patient very much, but just the opposite is true. It hurts in the beginning, but while the cup is on the pain subsides.

The chief advantage I see in this procedure is the possibility of preventing a mammary abscess, if the cup is applied as soon as the infiltration is discovered. If treatment is begun, it will prevent further development. I found in this case that the lump which developed in the nipple disappeared after three or four applications. I have treated her almost four weeks, but that does not speak against the method, because the conditions were such that I could not see her every day, and could not see her long enough. If the cup is applied several times a day, say five or six at three minute

intervals, I am sure the same number of treatments I have given her could have been made in three or four days, and Ihave no doubt the infiltration would have disappeared.

DR. C. S. BACON: I had an opportunity to see this treatment in three or four of the German clinics last season. It seems to be in general use in all of the clinics, and its value seems to be well recognized. There is, however, not entire unanimity of opinion; in one or two of the clinics I heard some criticism of the method, some even holding that it was not very much preferable to the former method in use of bandaging, and chiefly because there was rather more pain connected with the treatment at the beginning in severe cases. I have not had an opportunity to use it, because I have not had the luck to have any cases going to suppuration. In the hospital during the last two years there were about 200 cases, and I simply resorted to the old method of bandaging, which seemed to be sufficient, except in one case which resulted in abscess. My belief is that if there is an abscess, if there is pus, this is undoubtedly the method to adopt, but whether it would be more efficient than perfect rest and ice before the development of an abscess, I have considerable doubt.

DR. EMIL RIES: After I had observed the Bier treatment in Gratz and other German clinics, two years ago, I carried it out and advised my friends to try it. I have seen five or six cases, and not one lasted more than five days. Dr. Banga's case, which he demonstrated, lasted three or four weeks, but it would not be fair to Bier to blame the poor success in this case to the method, because it was not carried out properly. In the first place, the whole breast should be taken into the cup. Those who are not able to get the directly imported original cups which are on sale in Gratz, in various sizes, can use what they sell here as a breast developer. That was what I first used. It is something like a gas globe with an outward flange all around, in which you can put a good-sized breast. I had an instrument maker arrange one of these with an aspirator. It is a mistake which must cause much unnecessary pain to put a small cup just over the opening; that is not Bier's treatment. Any one in Germany who carries it out must take the whole breast in the cup. It is given for three quarters of an hour morning and evening, with four minutes off and four minutes on. I have seen cases go five or six days; they were suppurative cases with an enormous amount of pus discharge, in one case at least a quart. I saw her after five days with a breast perfectly soft and free from pain, and the woman nursing all the time. As to cases where the process has not gone on to suppuration I have no personal experience, but have had with a number of other areas of infiltration, and by using a cup large enough to take in the entire area of inflammation, have never seen a case where it hurt the patient and did not produce material benefit. In gynecology there is at present a tendency to use the Bier method of treatment in other directions. I have made experiments with chronic endometritis; you all know those intractable forms that do not get well under any treatment. Curettement is of no use; eradication is of no use and is dangerous and disagreeable to the patient. I welcomed the Bier treatment for that condition and made experiments in two cases I had not been able to cure in any other way; after two applications the women had no further discharge. They were both cases of old chronic infection; they had had leucorrhea for years and had undergone various treatments at my hands and also of other gynecologists, but did not get well until four or five applications of the suction apparatus especially prepared for use on the cervix. One has been under observation a year, and the other four months, and both are well.

DR. HENRY BANGA, in closing the discussion, said: I was well aware that I did not have the right cups, and I stated that the discharge of pus from the area lasted only a few days. I also stated that I was surprised that the handling of that infiltrated area caused the patient so little pain; she surely would not have come a long distance to see me, for three weeks if it had hurt her. I meant to emphasize the remark made by Bier, that the treatment relieves pain; I wanted to give my experience as an added proof.

I agree with Dr. Ries that in the treatment of other abscesses it has the same good results, for instance, in stitch abscess after abdominal section it is possible to get all the pus out through the little hole you find when you withdraw the suture; it is not necessary to open the wound, you can get the last drop of pus out in this way.

EXHIBITION OF SPECIMENS

DR. C. S. BACON: I had the opportunity, through the courtesy of Prof. von Rosthorn of Heidelberg and Prof. Freund of Berlin, to show the molds designed by Prof. Freund and Prof. Rosthorn or the illustration and demonstration of the pelvic structures. These teachers recognize the advantage of molds over drawings for the demonstration to students of the structures of the pelvis. They are constructed in four sections, life size. They are typical casts, well colored so as to make a sec-

tion that can be easily seen, showing all the structures, but particularly well the connective tissues of the pelvis.

The first section is the ordinary mesial section of the unimpregnated uterus of a multipara. The second shows a lateral section, and is particularly valuable as showing the broad ligaments. The next section runs through the cervix and also part of the symphysis, showing very well the openings into the pelvis, while the frontal section shows especially the broad ligaments. As far as I know, these sections are not in use in this city. They are beautifully made. These four comprise the series to date, but there will be soon ready a number of pathological sections, I am told they will be ready within a few months. These cost 120 marks for the set.

SARCOMA OF THE OVARY

DR. BARRETT: This specimen is a rather badly degenerated tumor of the ovary taken from a 24 years old patient by Dr. Schaeffer in Marion Sims' Hospital a few days ago.

The patient did not suspect any trouble until January and supposed at that time that she was pregnant. The abdomen enlarged rapidly, and the tumor soon occupied a large portion. The specimen weighed 19½ pounds, as determined by weighing the patient before going to the operating-room and after the operation. The trocar was introduced into the tumor, supposing it was an ovarian cyst; very little fluid escaped. The wall ruptured and a great amount of this degenerated tissue was removed. The uterus and the other ovary were not involved. There were no other growths upon the peritoneum, but some few metastatic growths in the mesentery. The patient stood the operation poorly, failed rapidly and died the same day. Microscopic sections showed this to be a large round-cell sarcoma of the ovary.

This specimen, operated upon about five weeks ago, was a tumor which, when removed, was about the size of the first one. The patient lived out of town, and I was not able to follow the case clinically or give it close study. I do not know what the blood count was. The patient was 57 years of age, menstruation had ceased ten years previously. She was well until four months before the time when I first saw her. The tumor had grown rapidly, and I suspected a malignant growth of the ovary, because there was first a tumor, next marked cystitis, and emaciation out of proportion to the size of the tumor. Hard nodules were found in the vault of the vagina, and the blood vessels over the abdomen were distinctly enlarged. When the abdomen was opened this large sac ruptured; it was very friable and contained about a quart of dirty brownish looking material. The ovary I have here was involved with the same kind of growth; apparently the uterus was primarily involved and the bladder and bowel slightly involved. This tumor was not attached to the tube, it broke off from the broad ligament. The tube on the left side remained free, the opposite tube and ovary were removed. We also found that there was a growth occupying the omentum and part of the transverse colon.

DR. C. M. ECHOLS, Milwaukee (by invitation): I have brought two specimens which I thought might be of interest to the Society. One illustrates a rare form of pregnancy occurring in a patient operated upon six weeks ago by my associate, Dr. Thienhouse, and myself.

The history is briefly: This woman, 24 years of age, had previously borne one child. About four months before operation she stopped menstruating and supposed she was pregnant. Some time later she consulted her family physician, partly to confirm her own diagnosis and partly because she had considerable pain in the pelvis. He found at the right of the uterus a movable mass attached to the uterus, and made a diagnosis of pregnancy of the right tube, and advised operation, which she refused. She took a long walk about six weeks ago and felt something give way in the lower part of the abdomen on the right side. She was brought to the hospital in a state of exsanguination, the abdomen being distended with fluid. On hurried laparotomy we found about a litre of clot in the abdomen and at least three times that amount of unclotted blood. I can illustrate this by a drawing. The uterus had the size and consistency of a pregnancy of 2½ months, the left tube and ovary were normal. On the right side there was a rudimentary horn of the uterus growing up half-way between the internal os and the right cornua; from this projected a pregnancy which had occurred in this rudimentary horn and which had ruptured at this point; the fetus of about 3½ months was lying among the intestines. There was no communication between the cavity of the main uterus and the cavity of this rudimentary horn.

The operation consisted in removing the rudimentary horn, leaving the uterus and left ovary undisturbed. The pregnancy evidently must have occurred through the left tube, and one of two things always happen in these cases: external migration of the ovum from the left ovary, the ovum entering the right tube; or else the spermatozoa find their way through the left tube to the abdominal cavity and finally become lodged in the opposite side in the rudimentary horn. In

this case I saw no corpus luteum. There was no evidence of a recent corpus luteum in the ovary which was removed, and consequently I infer the pregnancy occurred through external migration of the ovum from the opposite side.

Here is another specimen. This was removed from a girl of 16 years, who was very well developed, but had never menstruated. Her physician sent her to the hospital on account of severe pain in the lower part of the abdomen. Examination showed there was no vagina. The external parts were normal, but there was no vaginal opening. Upon incision we found two uteri entirely separate, held together by small fibrous bands, with no connection with the vagina. Here is one uterus not as large as a pigeon's egg, here is the tube growing from it. The uterus on the other side was larger, almost as large as a hen's egg.

EXHIBITION OF SPECIMENS

DR. EMIL RIES: I have the good fortune to present to you two cases that are unique, and three cases which may illustrate a certain difficult question in gynecology.

I have here a Pacinian corpuscle, which was found in routine examination of a tube removed on account of inflammation. The history of the case contains nothing of interest with reference to the Pacinian corpuscle. It is perhaps worthy of mention that there was no more pain in this tube than in the other. The case was of subacute salpingitis, made acute by unnecessary interference by curetting the uterus. On examining this part of the tube we find a typical corpuscle with the concentric layers, and the central nerve filament; and the only difference between this Pacinian corpuscle and the kind you saw in your early days of histology is that the layers are wider separated than in the normal Pacinian corpuscle. This separation is accomplished by a substance which appears to be myxomatous and which has been found in these corpuscles when they have undergone pathological changes in other regions of the body. I find no reference in the literature to a Pacinian corpuscle of the tube; there has never been a description of such a thing. For comparison I have here a Pacinian corpuscle which I found accidentally when I removed inguinal glands for melano-sarcoma. The corpuscle here is normal and has less separation of the layers than the tubal corpuscle. I show the two together so you can see how alike they are; and to prove that we are not dealing with connective tissue layers about a blood vessel I have brought the terminal nerve filament, which you see cut in two places. You can recognize that it is not a capillary with dense connective tissue around it, but a real Pacinian corpuscle. The pathology of the corpuscle is somewhat uncertain, probably it is important and has not received sufficient attention. I know of only one extensive paper on its pathology, which was written by Prof. Walthen of Ann Arbor. He shows a number of these corpuscles which were removed post-mortem or in operations from the mesentery and the retroperitoneal tissue, but reports none from the tube. Here is a reprint of the article in which you can see the drawings of the layers, of which you will be reminded when you look at these sections. This it the second time in my experience in which I have found these corpuscles. I found one ten years ago and was so surprised that I would not trust my own eyes and have never published the case, I did not dare to until I had found another.

The next case has an interesting history. A woman had what was supposed to be a fibroid, and a surgeon went to her home to operate, opened the abdomen and found a big tumor, said it was inoperable. The family physician urged him to close the abdomen if he could not remove the tumor. There was a little subserous tumor sticking up which he removed, and sewed with silk. The woman came to Chicago, and I had an opportunity to operate the fibroid. It was necessary to dissect the ureters from the fibroid, but there was no great difficulty, and the woman recovered. When I obtained the specimen, I got two silk ligatures from the fundus of the uterus, that had been there four months; they stood up distinctly from the fundus, a few small strands of silk running up from the uterine ligature. We do not suppose that silk will stay in the abdominal cavity for any length of time, and the fact of the silk ligature in the uterus was interesting. It is well known by long continued research that practically all substances, except metallic substances, are more or less absorbed in the course of time. It was interesting to find how much of the silk had been absorbed in four months. I made sections through the uterus, and it is interesting to see how the silk ligature is taken care of by the body tissues. Around each strand of the suture in the muscular remnant of the fibroid there is some infiltration; there are masses of giant-cells, and giant-cells are found free between the meshes in the silk. Particles of silk have been chopped off and carried into the tissues some distance from the silk suture. You can see here particles of the silk and giant-cells which have been described in other parts of the body, but never described in the uterus, and as we are particularly concerned with the pathology of the uterus it is interesting. Catgut will do the same. We consider that it is absorbed and carried off, but it is

treated in the same way, chipped off and taken care of by giant-cells. I have specimens showing the fate of silkworm-gut and of catgut in other parts of the human body, but this is the only chance I have had of investigating the behavior of silk in the uterus.

The third specimen was obtained from a woman of forty odd years who had ascites and cachexia. She had a big tumor in the abdomen. The rectum was compressed by the tumor, and it was a question whether the woman could be relieved by the removal of the ovarian tumors or not. I opened the abdomen, emptied a large amount of ascitic fluid and found two universally adherent ovarian carcinomata with metastasis in the liver and in the retroperitoneal glands (which were enlarged and hard), and the peritoneum covering the bladder and in the wall of the rectum, so that it was impossible to remove all. Under these conditions I decided to close the abdomen, after removing a small piece from the omentum for microscopic examination. Examination of this piece of omentum showed carcinoma. The woman lived three weeks and died of intestinal obstruction. There was a post-mortem two hours after death, and conditions were found much as during the operation. We removed various organs that were of interest. When a malignant tumor of the ovary has been operated and there subsequently develops in the parietes of the abdomen malignant growths, it is generally assumed that this is due to infection of the abdominal walls. The possibilities of such a thing have been denied, and many researches have been carried out for the purpose of ascertaining how these tumors originate in the abdominal wall; at least two papers treat especially this question of the origin of parietal abdominal tumors. This specimen shows something that has not been mentioned in the discussion of the question, namely, underneath the peritoneum and all around the incision which I made are small nests of carcinoma which it would have been impossible to recognize with the naked eye. Suppose I had removed these ovarian tumors, that they had ruptured and the woman had developed a tumor of the abdominal parietes some time afterwards, we would have had a case where the possibility of the transplantation of the malignant masses to the abdominal incision would have had to be considered. In this case, if the woman had lived long enough she would have had a tumor of the abdominal parietes. In her case there was no possibility of having infected the abdominal incision, because nothing was removed. Also the nests of carcinoma that extended under the incision extended all around it for a considerable distance on both sides. When we speak of the development of carcinoma following carcinoma operation, this question of pre-existing nests must be considered. It is extremely difficult to say in any case that you have removed all the carcinoma existing in that particular patient. You know how in carcinoma of the uterus we were satisfied if we could prove that it had not extended from the cervix to the broad ligament. But we know from observation that it may be present in the glands and the parametrium. In the same way we have to consider the possibility of metastasis in carcinoma of the ovary. Cases in which parietal tumor develops after operation for malignant tumor do not prove that there was infection during the operation, unless it is proven conclusively that there were not pre-existing microscopically small nests under the peritoneum at the time of operation.

DR. J. CLARENCE WEBSTER: I have two specimens that bring out interesting points. One is a uterus removed 18 months after a ventro-suspension operation, and shows a suspensatory band four inches long. The first operation was a failure, the uterus was lying down again in the hollow of the sacrum and was removed.

The next specimen is a very interesting one of torsion of a distended tube, a hemato-salpinx of 2½ drams content. There were marked adhesions. The tube is not involved in the torsion.

The next specimen is from an interesting case in which there was a marked salpingo-ovaritis of the right side with the appendix very firmly imbedded between the tube and ovary. At the operation the parts on the right side were removed, leaving the appendix still attached and in situ. I have seen three cases of this kind in the last year, and such a specimen is always of interest in discussing abdominal versus vaginal operation in infected conditions. This is a case which might very well have been overlooked by the operator working by the vaginal route. There were very extensive adhesions, and there would have been much loss of blood in ligating the infundibulo-pelvic ligament; nor would it have been easy to locate the appendix.

The next specimen is one of great interest. I was called to see a woman about two months ago, with a temperature and threatened abortion. She had been flowing for nearly three weeks and had had a temperature for seven or eight days. On examination I found the os considerably dilated, with a black clot protruding. In view of the condition and the temperature I emptied the uterus and cleaned it out thoroughly. She improved, and in about a month's time the physician reported that she was again bleeding. She had a history of prolonged hemorrhage after all her previous labors, and her doctor described her as having a large,

boggy uterus. Ergot did no good whatever. It was thought that possibly there was something in the uterus, and she was again scraped out by her doctor in her home town. Unfortunately the scrapings were thrown away. She did not improve but continued to bleed, her temperature continued, and I was called again to see her, a week or ten days ago, and found a swelling in the left side, somewhat tender, leucocytosis about 13,000, and a very high temperature. The blood was down to about 45 per cent. I advised interference, she was brought to the hospital, and I did abdominal operation. The uterus was a little enlarged, there was a swelling in the left broad ligament, not in the tube or ovary. This swelling was about two inches in diameter and looked something like a hematocele, although quite round and distinct, but a projection upwards into the infundibulo-pelvic ligament seemed like inflammatory infiltration. I decided to extirpate the entire pelvic viscera, and began on the right side and worked across. From the incision in the swelling on the right side there popped out several little cyst-like bodies. I extended the incision through the peritoneum up along the infundibulum and found the ovarian vein very much enlarged on the left side; the vein was the size of my little finger and there was evidently something in the vein, and this something were the little cysts. I made a dissection under the sigmoid flexure, went in above this mass, ligated the ovarians and worked down, and removed very completely. You will see here the broad ligament mass close to the uterus, but distinct from it; the lining of the uterus is quite clean. An examination of the specimen shows it to be a hydatid mole. I think this a rather interesting case, there being no primary lesion. The mass in the broad ligament extended into the ovarian vein. I removed the vein and opened it, and there were several of the grape-like bodies floating in the blood of the vein.

The next specimens are two gallstones from the common duct. There were six more. This case is of interest from the operative standpoint. It was one of chronic jaundice with occasional recurring attacks of severe pain. The patient was stout and had chronic bronchitis. I operated about three weeks ago and found enormous distension of the bile ducts with nothing in the gallbladder, extensive adhesions in the jejunum anteroposterior, and eight stones were embedded in the diverticulum posterior to the duodenum. I went through the duodenum anteriorly and then through the posterior wall, opened into the duct, removing the stones, making a free opening for the discharge of bile, then closed the duodenum. The patient has made a good recovery. It is the first case of the kind I have met, but it could not have been done in any other way; it would have been impossible to get the gallstones without going through the duodenum.

Dr. Henry Banga: This specimen is from a patient 47 years old, who had her last child some twenty years ago, and who was told that she had a fibroid some twelve years ago, at which time the tumor reached to the umbilicus. She never had symptoms from the tumor except that she felt uncomfortable on account of its size. There was very little pain, but of late she has had more or less distress and made up her mind to be relieved of the tumor.

When I examined her I found on the left side a tumor reaching nearly to the umbilicus. It was hard and separated by a deep sulcus, the left side being irregular in form. There were small tumors felt through the abdomen, and I could hardly reach the cervix which was high up on the left side, while the tumor extended down into the cul-de-sac. It seemed to me that the tumor was movable. I went in through the abdomen and found some adhesions, especially on the left side, from the omentum. After detaching these I tried to raise the tumor from its deeper attachment; it seemed imbedded in the broad ligament. There was much difficulty in bringing it up, so I took a tenaculum and attempted to lift it, when pus welled out, and I realized that it was not a solid tumor, as I had thought. The pus was not offensive. Dr. Herzog was kind enough to examine it and found it sterile. I finally got the tumor out from the bottom after I had made an incision and emptied it, so that I then had a sac to be detached. The other half of this tumor of the uterus, which is a fibromata, does not now look of the same size as it was at operation. Here you will recognize the very much distended tube. I could not recognize this while it was in situ, as it was so flattened out by the tumor; afterwards in examining the specimen I isolated it from the tumor.

One point I want to mention; there was a great deal of oozing where I shelled out the lower section of the tumor. The report of Dr. Herzog that the pus was sterile indicated that I could close without drains, but on account of the oozing I decided to put in a Mikulicz pad and then remove the uterus by supravaginal amputation. In the afternoon the patient began to show signs of collapse and at 4 o'clock I was informed that the pulse was scarcely palpable. I saw her at 5 o'clock; there were apparently no bad effects from the anesthetic; there was some pain; she felt extremely weak, and I could hardly feel the thready pulse. At first I thought, of course, she

was bleeding, and I opened the dressing, and while it was soaked I thought it was not enough to account for the collapse, and the more was I satisfied that it was not a hemorrhage, because in spite of the pallor her lips were blue. I have found several times, especially in extra-uterine cases, that this is a valuable sign for a differential diagnosis. If there is an internal hemorrhage which is causing collapse, the lips are exsanguinated and not blue. In cases of collapse due to weakness of the heart, the blood is still in the lips and they are bluish and cyanotic, because it does not circulate at the proper speed. Acting on this symptom, I did not disturb the wound further, and the next day she was practically well.

After 48 hours I removed the Mikulicz, and she made a perfect recovery.

DISCUSSION OF DR. BANGA'S SPECIMENS

DR. EMIL RIES: The well-known diagnostic proficiency of Dr. Banga is probably the only reason why he should feel aggrieved over such a mistake and report it. Probably all the rest of us have made such errors and have not thought much of it. I have had opportunities of observing Dr. Banga's diagnostic abilities and have the greatest respect for them. The fact that he reports a mistake, makes it well worth considering. This mistake to take a pus tube for a fibroid has happened to me repeatedly, and I thought it was rather to be expected once in a while. I rise rather to the discussion of some of the technical questions. Dr. Banga spoke of oozing and his method of stopping it, and the condition of the patient after operation. These two things interest me greatly, and I hope they will be discussed by the members of the Society. You remove a tumor which is more or less adherent and open up spaces of connective tissue which causes more or less oozing. In olden days the surgeon used to take the thermo-cautery and passing it over the oozing surface cause coagulation by heat. That usually sufficed, but it is a cumbersome method, and we do not like now to use it. I have seen another method in use. When there is oozing after detaching an adherent tumor, take alcohol on a sponge and wipe off the surface, and it immediately dries up. The alcohol is aseptic, the blood coagulates and therefore closes the small oozing vessels. I have used this method in a number of cases and consider it worthy of confidence. The oozing and opening of connective tissue space is important in the radical operation for carcinoma of the uterus, in which large connective tissue space has to be opened, and unless rapid fatal sepsis sets in, quite a number are likely to recover. When we have stopped the oozing in the course of the operation by hot sponges or otherwise, we assume that will be sufficient, but we do not know that it is always reliable. If you have an extensive case of tubercular adenitis of the groin, you stop the oozing and close the wound. You examine the case after a week or ten days, and there is a little opening and the oozing may continue for several days. The old surgeons called that secretion of the wound. It seems to me in these operations we sever a large number of lymphatic vessels. Do they close up of their own accord, or slough into the wound? The peritoneum can take care of a large amount of lymph if it is not too much damaged. I would be glad to hear the experiences of others as to oozing.

DR. J. CLARENCE WEBSTER: I have not used the Mikulicz pack for many years in any condition except ectopic gestation. The last case in which I used it was three years ago in an extraperitoneal ectopic pregnancy where I removed the fetus and then packed. In packing the abdomen the danger of oozing of serum is great. The risk of sepsis of the tract is much greater where packing is used, and I believe the Mikulicz pad is largely given up now. I use gauze in the pelvis, and my experience is that there is always a flow of serum down into the vagina, and undoubtedly this cavity does become infected. Everybody has experience with oozing in abdominal operations. I have never tried alcohol, but my practice is now to fill the abdomen with salt solution in septic cases which ooze.

DR. C. B. REED: I was interested in the cases Dr. Webster reported, especially the hydatidiform mole. It is generally recognized that at least one half of these cases are preceded by hydatidiform moles. I would like Dr. Webster's opinion in reference to Marchand's statement in reference to the character of the degeneration of the chorionic villi. I believe that Marchand claims the chorionic villus is simply swollen and the grape-like bodies are the consequence of this swelling. I would ask the speaker if he considers the mole or grape-like bodies as myxedematous or edema.

DR. HENRY BANGA, in closing the discussion, said: I did not mean to advocate the use of Mikulicz again, it is at least five years since I have used it and then only in this special case. After the tumor was shelled out there was a cuplike cavity where the adhesions had formed. There was no tendency for the bowel to come down in the neighborhood, so I put in a few strips. Of course, if the packing had been left in more than 48 hours, there would have been more danger. The only use for packing is to drain.

DR. MAXIMILIAN HERZOG, by invitation, then exhibited slides of a very young ovum which, in his belief, was younger than that of Peters.

DR. RUDOLPH W. HOLMES: The first specimen is that of annular rupture of the cervix. The patient from whom this specimen was taken had had three full time pregnancies, and one which terminated by abortion. Her fifth pregnancy began in the fall of 1901, and delivery occurred July 17, 1902. Labor started at 2 A.M. of the 16th, although the patient insisted the membranes had ruptured two weeks previously. The interne found that there was no dilatation at 9 P.M. of the 16th; at about 10 P.M. I examined, and as the pulse was increasing, and the temperature rising, I determined to place a bag in utero. During the night contractions were intermittent up to 7 A.M. I then again examined and found two fingers' dilatation. As the woman was tired out, I determined to terminate labor. Before the patient was under the influence of the anesthetic she had two or three violent pains, the bag and a breech appearing at the vulva. It was found that the bag and breech had passed through the artificial opening: the cervix was severed for nearly its entire circumference at the vaginal junction. After the delivery of the placenta the small remaining bridge of cervix was severed. The puerperium ran a septic course; after a few days she was transferred to the Presbyterian Hospital, and in due time was discharged well. Some two months later she had all the molimina of menstruation with a most intense urticaria; for the first day or two of these molimina she had very severe uterine pain. No menstrual flow appeared. She had a repetition of these disturbances the next month. She was admitted to my service at the Passavant Hospital, and an endeavor was made to open the closed uterine canal — this was found impossible, and as she took the anesthetic very badly, prolonged attempts were not made. Later she was readmitted to the service of Dr. Brougham who did an hysterectomy. On opening the uterus no menstrual fluid was found.

I saw also two other cases of incomplete annular rupture due to traumatism. The first case occurred in this city; the patient had a flat rachitic pelvis. The physician had applied forceps twice with the head floating — both times the forceps slipped off. I found that he had pushed the right blade through the cervix, and, when the instrument slipped, the cervix was torn away annularly for about half its circumference. She recovered.

Again, I saw a patient in the country who had been delivered by a difficult version and extraction. After the delivery of the placenta the physician discovered a tear which extended up into the broad ligament; a long, narrow mass of tissue (perhaps four inches long) was found protruding from the vagina, which was considered to be intestine. He replaced it and tamponed. The next day I saw the woman in her home, a farmhouse seven or eight miles in the country. At first feel the pendulent mass felt like prolapsed bowel. When exposed to the light it was discovered to be a cervix, torn from its attachment to the extent of more than half of its circumference. She recovered after a prolonged sickness.

This specimen is a uterus perforated by some instrument. You can see that the fundus is practically entirely gouged out. A man now resident in the penitentiary had induced an abortion. She was later admitted to an hospital where a very capable operator proceeded to clean out the uterus. When a glistening membrane appeared at the os, it was taken for membrane, which soon proved to be intestine. In a very few minutes the abdomen was opened, the uterus removed, and the bowel, extending from the sigmoid to within two inches of the pelvic floor, was resected. She recovered after a prolonged course of treatment for her fecal fistula.

This uterus was removed from a woman dying from the results of a criminal abortion. The woman went to a midwife with a friend who had had several abortions performed. The dead woman paid five dollars for her abortion, as it was her first; the friend only paid four, as she had been there before. The patient under consideration almost collapsed on the table, but finally rallied, went home, only to bleed for some weeks. Two physicians attended at the end of this period. A tampon was introduced; the next day the tampon was removed and a manual dilatation performed. She died about an hour after delivery. You see the uterus is torn from the external os to the fundus.

EXHIBITION OF SPECIMENS

DR. HENRY F. LEWIS: This was a solid tumor in the posterior walls. In the fresh specimen it was soft and very full of blood. I put a slide under the microscope, it is a degenerating fibroid. There was considerable oozing, considerable hemorrhage, considerable extravasation of blood, with dilatation of capillaries and vacuolization of a number of cells.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

JOHN B. MURPHY, M.D. — E. WYLLYS ANDREWS, M.D.
FREDERIC A. BESLEY, M.D. — WM. R. CUBBINS, M.D.

COLOPEXY. By Ch. Lenormant.

OPERATION	No. of Cases	Mortality Per Cent.	Recurrences Per Cent.	Cures Maintained for 1 yr. or over Per Cent.
Colopexy	102	nil	26.4	30.8
Colopexotomy	5	"	20	60
Resection of the prolapse.	110	10.9	8	12.7
Resection of the mucosa.	25	8	none	56
Rectopexy	54	"	18.5	24

The author has made an exhaustive study of the literature on Prolapsus of the Rectum. He has tabulated as above the operative results of cases treated by operation. In his article, he reports in detail 102 cases of prolapse of the rectum, in which the operation of colopexy was performed. He is persuaded that no single operation can be successful in every case of rectal prolapse. Each method has its indications; all are useful; not one is infallible. Rectopexy has given many brilliant and durable results; but the failures are many and the percentage of recurrences is high.

The author is partial to colopexy of which he describes two types: 1. simple colopexy, which consists, after complete reduction of the prolapse, of fixing the pelvic colon to the abdominal wall, so as to prevent any future descent of the large intestine. There is a condition the presence of which is indispensable to the performance of this operation, that is the reducibility of the prolapse; if the rectal prolapse be irreducible, this operation must not be attempted. In colopexy, we content ourselves with fixing the intestine to the abdominal wall. 2. In colopexotomy, after fixation of the intestine to the abdominal wall, the gut is opened. The segment of gut distal to the opening is thus put at rest. This operation has not been performed often. After the rectitis is cured, the opening in the intestine is allowed to heal.

Colopexy was first performed by Jeannel. The author admits that the suspension of the rectum which is obtained by this operation is artificial. But in visceral ptoses artificial suspensions are useful, if they be harmless and firm, as for instance hysteropexy, nephropexy, etc. This operation, as a reference to the table will show, has had no operative deaths.

Most of the operators have selected as point of fixation the anterior abdominal wall at about the level of the right iliac fossa. The author believes, however, that it is far better to fix the colon to the postero-lateral wall of the false pelvis, in the iliac fossa. The advantage of this fixation is double, the position thus occupied by the colon is more natural, is closer to the normal; and the point of fixation is immovable. The author believes that the frequency of recurrences is due to the fact that cure has been sought by the formation of adhesions between two serous surfaces. Adhesions of this nature frequently lengthen; frequently are absorbed. Such a fate, however, does not occur to the extremely intimate and durable adhesions that form between a surface that is covered and one that is not covered by peritoneum.

Technique: 1. Incision from 10–12 cm. in length, parallel to Poupart's ligament on left side, more or less close to it, that is about 3 or 4 cm. above it.

2. Reduction of the prolapse and determination of the part of intestine which is to be fixed. The inferior end of the pelvic loop is the one which is to be fixed.

3. This loop will be fixed to the lateral pelvic wall (internal iliac fossa) in that position which is least abnormal; which is most natural. Angulation must be avoided. It is avoided by sewing the intestine to the iliac wall for a length of from eight to ten centimeters. No spur is formed then.

4. At the site where the colon is to be fixed, the pelvic surface is denuded, by dissection, of peritoneum. That is, a flap of peritoneum 8– 10 cm. long and 4–5 cm. wide is removed.

5. To this site the colon is sewed. The mesenteric border to one edge of the denuded surface. The colon lies upon this denuded area, being bound down on each side by sutures which include peritoneum, subperitoneal fat, and cellular tissue, the fascia iliaca and the most superficial fibres of the iliacus muscle.

6. The abdominal wall is closed.

The operation may be completed or rather supplemented by one which reconstitutes the perineum, which diminishes the caliber of the anal opening.— *Revue de Chirurgie*, Paris, 1907. Vol. xxv, p. 191. AIMÉ P. HEINCK.

FURTHER EXPERIMENTAL RESEARCHES ON THE QUESTION OF THE TALMA OPERATION. By Dr. K. Omi (Formosa, Japan), from the Breslau Surgical Clinic. Prof. Garrè, Director.

This work is in continuation of a previous article published by the author and Prof. Ito in the "Deutsche Zeitschrift für Chirurgie." In this previous article the conclusion had been reached that the omento-fixation was only a part of the whole process and that whether it was fixed intraperitoneally or extraperitoneally was of no importance, the important thing being to produce between the intestines, liver and spleen extensive adhesion and also between these organs and the peritoneum. Wide tamponade with gauze was recommended for this purpose.

In order to determine in what other ways vascularized adhesions might be produced, or in other words, in what way the greatest extension of the portal collateral circulation might be brought about, Omi made experiments on 20 dogs.

As he had already determined that the omentum played but a minor part in the formation of new blood paths, in one animal Omi resected the omentum entirely and then produced by extensive gauze tamponade sufficient vascular adhesion between the intestines, liver and spleen that the animal survived although the V. Portæ was ligated.

In one other animal sterilized ox-bladder was sutured between visceral and parietal peritoneum. This was, however, so rapidly absorbed that adhesions of sufficient strength were not produced.

Omi also takes up the question of the collateral circulation via the renal veins. In a series of 23 days, he carried out the process of wide tamponade to produce peritoneal adhesion as noted above, and, in addition, placed the kidney intraperitoneally, and sutured to it the omentum or mesentery. In these cases a few days later a second laparotomy would be made and the V. Portæ tied. It was found in at least one case that the new blood paths between the kidney and mesentery or omentum were sufficient to take the place of the portal circulation and prevent the death of the animal.

Still another series of experiments were made in which the V. Portæ and both renal veins were tied, intraperitoneal adhesions being previously produced. One of these animals lived 2 days.

A dog, both of whose renal arteries were tied, lived 3 days.

Omi notes the results of his experiments as follows:

1. By the use of gauze upon the inner surface of the abdominal wall firm and extensive adhesion may be produced between the abdominal wall and the abdominal organs.

2. Dogs die in 1 to 3 days with uremic manifestations when both renal veins are tied.

3. When the kidneys have been sutured to the omentum or mesentery:

a. Some animals bear the tying of the V. Portæ, some no not.

b. Some animals lived for a time, after both renal veins were closed.

c. A solution of Berlin-blue injected into the portal system succeeded in reaching the kidney-tissue. Also, when injected into the V. Cava, the color was found in the portal system.

4. In these attempts to produce adhesion between the kidneys and omentum or mesentery, it seems to be of no importance whether the kidneys are decapsulated or not. The implanting of the omentum after nephrotomy produces excellent anastomoses.— *Weitere experimentelle Untersuchungen zur Frage der Talma'schen Operation.* Beiträge zur klinischen Chirurgie, Band 53.

W. C. DANFORTH.

SARCOMA OF THE SMALL INTESTINE FROM THE VITELLINE TRACT. By Raymond Grégoire.

The author draws attention to the rarity of the sarcoma of the small intestine. He has found only 81 observations, and to this he adds a new case. This was discovered while doing an operation for generalized peritonitis of unknown origin. It was a round, purplish red tumor of firm consistency, of the size of an orange. It was adherent to the free margin of the intestine about 35 inches from the cecum. The lumen of the intestine was not encroached upon by the neoplasm. It was through this tumor that the generalized peritonitis had developed.

The histological examination showed the tumor to be made up of small, round cells.

There are various points of interest in this observation. First, the location of the abscess in the sarcoma is rare, even in case of the neoplasm being located in a septic area. Second, the shape of the tumor is one not generally seen in cases of sarcoma of the small intestine, as that is generally an annular form, and may produce dilatation of the lumen of the intestine and at times destroys the wall to such a degree as to produce perforation. In this case, on the contrary, the tumor is globular,

the lumen is not changed, and the situation on the free part of the intestine 35 inches from the cecum makes one think of a tumor of vitelline origin. This, it can be seen, is extremely rare, although the cysts arising in this location are well known.—*Archives générales de Chirurgie*, July, 1907. Author's Abstract.

TETANY AFTER PARATHYROIDECTOMY IN HERBIVORA. By W. G. MacCallum, H. S. Thomson, and James B. Murphy.

Numerous experiments by different authors on the extirpation of the thyroid parathyroids in herbivora have generally resulted negatively as far as the production of acute symptoms of tetany is concerned, and the statement is frequently made that extirpation of the parathyroids in herbivora is a practically harmless procedure, whereas in carnivora it results in tetany. This difference is thought by some authors to be due to the difference in the character of the food of these classes of animals.

Eight goats and five sheep were used in these experiments, and great care was taken to actually extirpate four distinct parathyroids in each and confirm this by microscopical examination. Two of the goats showed no symptoms, four showed occasional slight twitchings, while two developed typical violent tetany, leading, at least in one case, to the death of the animal. Of the five sheep none showed any definite tetany. All of these were mature animals, and it is possible that experiments with younger animals might give more positive results.

Possibly there is in these animals a wide distribution of parathyroid tissue, so that even yet some of it has been overlooked. It does not seem reasonable to suppose that organs clearly shown to have a special function in carnivora and other animals should be so highly developed in herbivora and still have no function, and while it is difficult to produce tetany in these creatures, it is shown by the above mentioned cases to be possible.—*Bulletin of the Johns Hopkins Hospital*, September, 1907. Author's Abstract.

ON THE OCCURRENCE AND PHYSIOLOGICAL NATURE OF GLANDULAR HYPERPLASIA OF THE THYROID (dog and sheep), TOGETHER WITH REMARKS ON IMPORTANT CLINICAL (human) PROBLEMS. By David Marine, M. D., Cleveland.

Marine, believing that the various problems associated with thyroid lesions could be best studied in animals, has conducted an extensive investigation, both anatomical and experimental, using mainly for this purpose the dog and sheep. In Cleveland, where this work was carried on, he finds that at least 90 per cent of all street dogs show glandular changes on histological examination. Sheep are effected to about the same extent. His material which forms the basis of this study consisted of 325 dogs' thyroids and parathyroids, 35 sheep's thyroids, 31 bovine thyroids, and 173 human autopsy specimens.

ANATOMICAL DESCRIPTIONS

1. *The Normal Gland.* The gross and histological appearance of the normal gland is described. It is practically identical histologically to the human gland, except that in herbivora the stroma is more prominent.

2. *The Glandular Hyperplasias.* Under this term the author includes all grades of changes in the thyroid, characterized by the production of the columnar types of epithelium with intra-acinar papillomatous growth, by hypertrophy of the stroma, by the increase in the blood supply and by a decrease in the stainable colloid. These changes, the author observes, are similar to those occurring in primary (toxic) exophthalmic goiter in man and identical with those described by Halsted following partial excision of normal dog's thyroid. All gradations from the normal gland to the most extreme types may be seen.

3. *Simple Colloid Goiter.* Generally speaking, the changes which the author notes in this condition may be designated as exaggerations of the normal structures of a normal gland. There was uniform and symmetrical enlargement of the lobes, thickening of the capsule and blood vessel walls. On section the acini are large, well defined and filled with dense uniform colloid and some blood pigment.

Microscopically the colloid stains uniformly and densely and sharply about the epithelium which latter is of a low type.

A table is presented with an analysis.

Table of analysis of 202 dogs' thyroids with regard to *size of gland*, *capsule vessels*, *stromas*, *stainable colloid alveoli*, *alveolar epithelium*, and *cell nuclei* is presented. Briefly, the analysis shows that of the 202 glands examined only 19 *were normal*, 15 *showed colloid hypertrophy*, 168 *glandular hyperplasia* (all degrees).

The Physiological Nature of the Glandular Hyperplasias. The author believes that from a careful study of his material, experimental and anatomical, together with the available literature, that the most rational conclusion is that it is a *physiological reaction* on the part of the gland to a demand from the tissues, and that these glandular changes are to be considered cretinoid in nature. He cites the following evidence.

1. Clinically, dogs manifest all degrees of the symptom-group from true cretins to normal dogs.

2. It effects the young, and they tend to recover spontaneously.

3. One can produce the same histological changes in puppies by partial removal of the glands from the mother before pregnancy.

4. The changes can be produced in normal dogs' thyroids by partial removal.

5. The hyperactivity of the gland is evidenced by the tremendous increase in the blood supply and the distended lymphatics.

6. Anatomically, all degrees of reaction were noted from the comparatively normal gland to the most marked glandular changes. Assuming that these glandular changes represent stages in a physiological reaction to a deficiency, which seems to the author the most natural deduction from the observed phenomena, he attempts to answer the question as to what might this deficiency be, against which the gland is reacting. Iodine naturally first suggested itself. In support of the view that iodine plays an important role in the normal physiological activity of the gland he cites the following data:

1. The iodine content varies inversely with the degrees of glandular hyperlasia.

2. Iodin or iodine containing compounds will reduce this glandular activity in the dog in all cases.

3. Iodine will prevent the occurrence of glandular hyperplasia after partial removal of normal glands which would otherwise hypertrophy.

4. Iodine will prevent the occurrence of hyperplasia of the thyroids of puppies from bitches in which ¾ of the gland has been removed.

5. Endemic hyperplasia of the thyroid does not occur along the seacoast. MacCallum found that about 7 per cent of the dogs' thyroids in Baltimore show glandular changes as compared with 90 per cent in Cleveland.

Effect of Feeding Iodin Containing Compounds on the Thyroid Gland and on the Organism as a Whole. Briefly stated, the changes the author found were these:

1. Marked reduction in size of gland as a whole.

2. Reduction in blood supply associated with obliterative endarteritic changes, similar to those occurring in endarteritic vessels during involution.

3. The acinar epithelium reverts from a high columnar to a flat cubical (this may take place in two weeks).

4. There is a rapid accumulation of normally staining colloid.

5. There is a great increase in the iodine content of the gland over that of the control lobe, and even over the normal content of a normal gland.

6. The lymphatics, instead of being the huge, sacculated trunks filled with rather clear watery fluid, become barely noticeable. The dogs' general condition shows equally striking changes.

The ease with which all cases of glandular hyperplasia in the dog revert to a colloid type upon the administration of iodine containing compounds suggests to the author that colloid goiter is the quiescent stage. In other words, in its simplest form and conception, glandular hyperplasia is the hyperactive stage of the cells, and colloid goiter is the quiescent stage after the deficiency has been met. He adds that if this interpretation of the formation of colloid goiter be the correct or usual mode, then the term "colloid degeneration" as applied to colloid goiter is a misnomer.

Effect of Iodin on the Human Thyroid. The author's only observation on this point was, that of 173 human autopsy specimens examined, all of the cases which had had iodine administered just prior to death showed the acinar epithelium to be in the quiescent (low cubical) stage.

From this study the author draws the following conclusions:

1. That iodine is essential for normal thyroid activity.

2. That glandular hyperplasia is a physiological reaction to a deficiency, and is to be considered cretinoid in nature.

3. That colloid goiter is usually preceded by a stage of glandular hyperplasia, and in its uncomplicated form is the quiescent stage of the same.

4. That the associated enlargement of the spleen, thymus, and lymph glands, in varying degrees, is an integral part of the affection.

5. That the commercial dessicated thyroid contains a mixture of normal and abnormal thyroids, and that this explains a part of its varied action clinically.

6. That further observations will show a closer relationship between the glandular hyperplasias in animals and toxic (exophthalmic) goiter in man than has been indicated.— *Bulletin of the Johns Hopkins Hospital*, vol. vxiii, 1907.

GEORGE E. BEILBY.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. Clarence Webster, M. D. E. C. Dudley, M. D.
J. C. Hollister, M. D. F. W. Lynch, M. D.

A Case of Chorion-epithelioma Complicated by Hematometra. By W. S. A. Griffith and Herbert Williamson.

The patient in this case was a woman aged forty-two years of age, who had borne four children. In December, 1905, after six months' amenorrhea, during which time the uterus enlarged very little, abortion was induced and a mole spontaneously expelled. This presented the characteristics of a carneous mole, except that a few vesicles were noticed on its surface. In January the patient suffered from persistent hemorrhage for which curettage gave no help. In March abdominal hysterectomy was performed. By this time the uterus was as large as at the fifth month of normal gestation. The ovaries were both enlarged by multiple cysts and were of a dark plum color. Examination of the uterus now revealed the interesting fact that the cervical canal had become entirely occluded by coagulated blood, so that a probe could be passed only with difficulty, the hemorrhage, previously external, had become converted into the concealed variety and led to the formation of a hematometra. The inner aspect of the anterior uterine wall showed an ulcerated growth, microscopic examination of which revealed a typical chorion-epithelioma, composed of both Langhans' cells and syncytium. All of the organs were unusually vascular. Lutein tissue was present in both ovaries in the cyst walls, in the stroma, and on the external surface. These lutein-cells are in marked excess. The writers believe that this case supports the theory that lutein-cells may arise by modification of the connective-tissue cells of the ovarian stroma.

In this same journal is the report of still another case by H. T. Hicks. The writer's remarks have to do entirely with primary chorion-epithelioma outside the uterus, and he reports a case which he describes as a case of primary embolic chorion-epithelioma of the vagina. He rather favors the theory of Hicks, that the chorionic villi migrate from the uterus to more or less remote parts, as the explanation of this condition. Hicks' patient was a woman twenty-eight years of age, the mother of three children. Following a seven months' amenorrhea she began to bleed, and a large hydatid mole, together with a five months' fetus, was cleared out of the uterine cavity. One month later she was passing a blood-stained discharge, the uterus was apparently somewhat subinvoluted, and a small, knobby, bluish swelling was discovered in the vagina. This mass was removed for examination and proved to be a typical chorion-epithelioma. Five months later a similar tumor was discovered in the vagina, which grew very rapidly. This was removed also, as was still a third within six weeks. Recurrence was again found to have taken place in a short time, and the growth soon involved practically all that was left of the vaginal walls and clitoris. The patient was by this time very anemic and died eleven months after the passage of the mole. On postmortem examination the mass in the vagina proved to be a typical chorion-epithelioma, and there was no secondary deposit in any of the organs, except a small one in the right lung. The uterus was enlarged and soft, but entirely free from the growth, as was also the bladder and urethra. The ovaries were small, containing one or two small blood cysts which show characteristic lutein-cells in their walls, but there is no obvious dissemination of lutein-cells in the ovarian stroma proper. Hicks thinks that the vaginal growths arose from the epithelium of embolic villi, spreading along the perivaginal venous spaces.— *Jour. of Obstet. and Gyn. of the British Empire*, vol. xii, No. 2, August, 1907. Carey Culbertson.

A Case of Chorion-epithelioma of the Uterus with Lutein Cysts in Both Ovaries. By G. F. Blacker.

Blacker reports this case from the records of the University College Hospital, London. His patient was a woman, aged 46, who had had five children and two miscarriages. Since the last abortion, one year previously, her periods had been regular until five weeks before entering the hospital.

During these weeks there was an offensive blood-stained discharge from the vagina. Examination showed a rounded swelling infiltrating the tissues about the urethra and occupying the anterior and left vaginal walls. It presented a friable, sloughing surface, with pain on pressure. These growths were removed by free excisions and proved to be chorion-epithelioma under microscopic examination. Therefore, one week later abdominal panhysterectomy was performed. The uterus was soft in consistence and considerably enlarged, and both ovaries were cystic. The interior of the uterus was occupied by a growth invading the uterine wall above and on the right side. The greater part of this is composed of fibrin and blood clot, covering a mass of chorion-epithelioma. Both tubes were healthy. Both ovaries contain a number of cysts, all of which are derived from corpora lutea. These cysts have no epithelial lining and are limited externally by a layer of fibrous tissue, internal to which in every case there is a well-marked layer of lutein-cells. A few lutein-cells may also be seen in the stroma of the ovaries, but there is no general distribution of them. Each ovary also contained a corpus luteum. Blacker thinks that the lutein tissue is decidedly in excess in both ovaries.

He therefore regards this case as a good example of the simultaneous occurrence of a chorion-epithelioma of the uterus with lutein cysts in both ovaries. While skeptical as to the theory that the development of a chorion-epithelioma in the uterus is due to an excess of lutein tissue in the ovary, that is, an overproduction of the internal secretion of that organ, yet he regards it as a most remarkable fact that such an excess of lutein-cells has now been met with in so many cases of hydatidiform mole and chorion-epithelioma. He argues that "it seems probable that the cause of the development of a chorion-epithelioma, conforming as it does to the general law of carcinomatous growth in that it affects a tissue which, if we consider the total period of its life, is already old, will be found not to differ from the cause of a malignant growth in any other part of the body, and that future researches will prove it to consist in some chemical change in the blood of the patient or in the fluids bathing the tissues of the part affected."

Blacker's case subsequently died and post-mortem examination showed metastatic growths of the same nature in the kidneys, small intestine, liver, spleen, lungs, and brain.— *Jour. of Obstet. and Gynec. of the British Empire*, vol. xi, No. 6, June, 1907.

CAREY CULBERTSON.

THE DISPOSAL OF THE UTERUS WHEN BOTH TUBES AND OVARIES ARE REMOVED. By Thomas Wilson.

Wilson, of Birmingham, writes as follows:

"But after the removal of both sets of appendages for suppurative affection the uterus, instead of quietly undergoing atrophy, has often been the source of severe pains and various discharges, so as to render its removal advisable at a later date. In many cases it is found that the uterus is universally adherent, that it is enlarged, and that both cervical and corporeal endometria are in a state of chronic inflammation. Such a condition of affairs is, of course, frequently to be expected, since infection usually spreads into the tubes and pelvic peritoneum by way of the uterus. Moreover, it has yet to be proved that the possession of a uterus devoid of appendages, especially when that uterus is more or less diseased, is an advantage to its possessor. The suggestion has been made based on no evidence, that by leaving the uterus the symptoms of the menopause are modified and that possibly the uterus provides an internal secretion in the same way as the ovaries are supposed to do. The question of the correct operative treatment of severe affections of both sets of appendages is still unsettled, but the above considerations have induced many surgeons, myself among the number, to undertake the complete removal of the uterus along with the appendages in cases where these are found to be hopelessly disorganized."

As regards method, Wilson prefers the abdominal route. He believes that "the total abdominal operation is in most cases not much more difficult to perform than the supravaginal, and presents two great advantages. In the first place, a frequent source of subsequent trouble is removed; the blood supply of the cervical stump is very apt to be interfered with to some extent in the supravaginal method, and the consequent interference with nutrition leads sometimes to a certain amount of necrosis, often permitting infection of the cut surfaces and pus formation. In the second place, the removal of the cervix permits free drainage to be provided into the vagina where this is considered desirable. On the other hand, the removal of the cervix has no corresponding disadvantages; the only argument for its retention is that it forms part of the pelvic floor, but experience has shown that this is not a whit less capable of supporting the super-incumbent viscera after it has been deprived of the cervix."— *Jour. of Obstet. and Gyn. of the British Empire*, vol. xii, No. 2, August, 1907.

CAREY CULBERTSON.

BOOK REVIEWS

MODERN SURGERY — GENERAL AND OPERATIVE. By John Chalmers Da Costa, M.D., Professor of Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia; Surgeon to the Philadelphia Hospital and Consulting Surgeon to St. Joseph's Hospital, Philadelphia.

It is a great pleasure, after viewing the succession of immense five and six volume compilations, to look over a carefully written and concise work such as this. The author has succeeded in including in the book some information, at least, concerning every topic of any importance in modern surgery. The book is of a handy size for the student's use as well as for ready reference by the practitioner.

The various general topics are first discussed, the more important quite fully, but without a degree of prolixity which would encroach upon the space needed for consideration of special subjects. The diagrams illustrating ligation of arteries are clear, though compact and somewhat small in size.

The subject of fractures and dislocations is handled fully, yet in a concise manner. One is glad to see that the treatment of these injuries is not neglected, and the more important forms of dressing are described and in many cases illustrated. Diseases of bones and joints receive adequate consideration, the important topic of bone and joint tuberculosis being particularly gone into.

Nearly two hundred pages are given over to abdominal surgery, and one reviews this portion of the book with especial pleasure. One notes with approval, in the chapter upon gastric surgery, that the author takes a conservative stand upon the question of operation upon cases of acute ulcer, holding that operation should not be done in absence of hemorrhage, perforation or obstruction. Nor does he believe that chronic ulcers should be operatively disturbed till all medical treatment has failed.

The always interesting topic of appendicitis is fully considered. The author lays stress upon the importance of the sequence of the symptoms in the acute attack, as pointed out by Murphy. As regards the advisability of immediate operation the author follows McBurney's rule. Ochsner's plan of treatment is commended in cases which refuse operation, or where the surgeon wishes to await an interval.

One approves the emphasis, in speaking of the treatment of acute peritonitis, laid upon immediate removal, if possible, of the initial lesion. Fowler's position, and the use of large amounts of salt solution per rectum.

The technic of various operations upon the gastro-intestinal canal are carefully described and in most cases illustrated. The noxious types of hernia and the operative methods of treatment are satisfactorily handled. More of the various methods in common use are described than in most text-books, and the author does not commit himself to any one.

Genito-urinary topics take up a moderate amount of space. The author favors the perineal operation for removal of the hypertrophied prostate and quotes excellent authority in support of his stand.

The various forms of radiotherapy and the use of X-rays in diagnosis receive consideration in the final pages. It has been difficult heretofore to find much upon these subjects in the usual surgical text-book, and one is glad, in view of their increasing importance, to find them included.

The book as a whole impresses the reviewer as a well-written compendium, complete in its inclusion of material, yet not erring upon the side of too great length of discussion.

The mechanical work is good, the paper excellent, and the type clear and easily read.

W. C. DANFORTH.

PHYSICAL DIAGNOSIS WITH CASE EXAMPLES OF THE INDUCTIVE METHOD. By Howard S. Anders, A.M.,M.D. With 88 illustrations in the text and 32 plates, 456 pages. New York and London: D. Appleton and Company. 1907.

In his preface the author dwells justly on the tendency of modern medical students to cultivate laboratory methods to the slighting, if not neglect of those symptoms of disease, both subjective and objective, on which our fathers were compelled to rely. Deploring also the evident inclination to superficiality of observation and to hastiness of judgment on the part of students, he aims to present as clearly and strongly as possible the principles underlying the means of physical examination and the proper method of their application. Emphasis is laid also on the value, nay the necessity of the

inductive method, if conclusions are to be logical and the diagnosis correct.

A perusal of the book shows that Anders has achieved his purpose by a systematic arrangement of his facts and by well selected case reports. His literary style, however, is not especially attractive, and here and there we have noticed positive grammatical errors, which certainly were the result of haste or carelessness. The chief defect in style in our opinion is the employment of too many adjectives which, although intended to produce clearness of expression, really defeat its aim by preventing directness and simplicity of style. Thus on page 199 he says, "It is here deemed more natural and rational and cultural to approach such study—" etc. These are minor defects, however, and may be overlooked in consideration of the manifold merits of this book.

A treatise on physical diagnosis can never be made very attractive and offers but scant opportunity for originality in its presentation. The most interesting and novel feature of the book is the part III, The Röntgen Ray in Medical Diagnosis, and part IV, which beside the index includes 21 Röntgenograms furnished to the author by Dr. Pfahler from his excellent collection.

In the arrangement of his subject the author follows the usual and unavoidable plan generally pursued in works of a like nature. First comes an introductory chapter which includes the following heads: The Definition, Standpoint and Importance of Physical Diagnosis, Physical Signs, Physical Diagnosis as a Science, the Relations of Physical Diagnosis, Qualifications for the Study of Physical Diagnosis and the Benefits. Part I is devoted to the chest and is divided into four sections, of which the first takes up the Methods and Technic, Physical Signs, and Diagnosis in General; section II, Special Physical Diagnosis of Some Diseases of the Respiratory Tract, Inductively Considered; section III, the Heart and Pericardium; and section IV, Special Physical Diagnosis, comprising a single chapter on Diseases of the Heart Inductively Considered. Part II is devoted to the Abdomen and its Principal Organs, being divided into section V, on General Examination of the Abdomen, and section VI, on The Principal Special Organs of the Abdomen. Part III is devoted to the Röntgen Ray in Medical Diagnosis, and part IV to Röntgenograms, previously mentioned.

In conclusion it may be said the work is really excellent and ought to prove of decided value not only to students, but also to insurance examiners and all others who feel none too well informed on the principles of physical diagnosis and desire to build up a substantial superstructure of practical knowledge upon a foundation of theoretical information.

The illustrations and plates are excellent, most of them having been borrowed from other works "because of the suitability," and the general appearance of the book is attractive. R. H. B.

FRONTAL FROZEN SECTION THROUGH THE PELVIC ORGANS OF A WOMAN WHO DIED IN LABOR FROM RUPTURE OF THE UTERUS IN A NEGLECTED CROSS PRESENTATION. With four tables and two illustrations. By Private Docent Wilhelm Zangemeister, from the University Obstetrical Clinic at Königsberg. Leipzig: F. C. W. Vogel.

The beautiful tables and careful description of the section are a valuable addition to our data for studying the causes of rupture of the uterus. Of the nine frozen sections of women dying in the second stage of labor previously reported and described only one was made in a case of neglected cross presentation and that was not one of rupture of the uterus. The case of Zangemeister is moreover unique, as it is the only one where a frontal section instead of a sagittal section was made.

After giving a history of the case and describing the method of making the section, the author first describes the position, attitude and location of the child as disclosed in the section and gives the measurements and form of the pelvis which was, it appears, only slightly contracted without sign of rickets.

The description and measurements of the uterus and obstetrical canal show a moderate dilatation of the vagina, a marked degree of distension and thinning out to one millimetre of the dilating zone of the uterus, a considerable projection inward of the contraction ring and the usual thickening of the contracting part of the uterus. Only about one-fifth of the contents of the child lay in the contracting part of the uterus, a large part of the remainder being in the dilated or lower zone. This is so much stretched from side to side and pulled up out of the pelvis that the ureters in their entire course are above the pelvic inlet.

The tear in the obstetrical canal extends from the contracting ring behind and to the right, downward and inward 5 cm. below the os externum. Its circumference measures 35.5 cm. of which 16 cm. are formed by the edges of the vaginal tear and the remainder by the edges of the tear in the cervix. The peritoneum is torn through opposite the latter, and the opening measures 5 cm. in diameter.

The author discusses the mechanism of the transverse position and finds no explanation of its cause in his case. The fine illustrations of the cone

shaped fruit and the Roentgen picture confirms the law that in transverse positions as well as in longitudinal the expulsive force tends not only to drive forward the passenger, but also to approximate the newly formed fruit axis to the axis of the obstetrical canal, that is the expulsive force has also a centripetal action. This is true when in the absence of fruit water and hydraulic pressure the force is applied mainly or exclusively to the fruit in the direction of its axis. A consideration of the various methods of auto-version and auto-evolution shows that here the Denman method was the only possible one.

The author next makes an interesting study of the retraction of the uterus and the ascent of the contraction ring. He comes to the conclusion that the hollow muscle tends to produce a concentric decrease in size. It does not cause an excentric pull of the wall towards the fundus nor a change in the place of the contraction ring. The conditions determining the ascent of the contraction ring are discussed and schematically illustrated.

In his consideration of the origin of the rupture the author calls attention to the point that in its lower part it was longitudinal, while above, near the contraction ring, it was circular, and draws the conclusion that it probably began in the lower part of the cervix as the result of various factors, but chiefly because of the introduction of the hand in the manipulations of the attending physician, and that it gradually extended in a circular tear above and a complete tear through the peritoneum.

A closing word concerning the therapy in similar cases emphasizes the need of early attention and the necessity in some instances of exenteration as preliminary to decapitation. C. S. BACON.

A MANUAL OF DISEASES OF THE NOSE, THROAT, AND EAR. By E. Baldwin Gleason, M.D. Philadelphia: W. B. Saunders & Co.

One obtains some idea of the rapid advance that has been made in latter times on the subjects of ear, nose and throat from the great number and character of books written upon these specialties.

One of the latest acquisitions to the already large list is E. B. Gleason's Manual of Diseases of the Nose, Throat and Ear.

Although intended essentially as a compendium for the use of students and general practitioners, and written as it is in a concise manner, it contains over 550 pages and 262 engravings. Many of the latter are original or drawn from dissections made by the author, and in the main are highly commendable. Very few old cuts are used, most all representing the most advanced thought on the various subjects.

The text is written in a very entertaining style and readily shows the author's progressive ideas and capability of discussing the subjects.

The first 292 pages are devoted to the nose and throat, sufficient space being given to a brief description of the anatomy and physiology. 200 pages are devoted to the ear, and at the back of the book almost 50 pages contain formulas, covering a large range of remedies used in the treatment of the various diseases under consideration.

The embryology has been left out, which is to be regretted, for an epitome of the same is always to be desired, although in a text-book of this kind it is impossible to expect an elaboration of many things that are important and essential to larger books.

In the introduction on the art of laryngology mention is made of Kirstein's method of direct examination of the larynx and trachea, but no reference is noted of the improved instruments and technic that Killian and others have so admirably added to this most interesting and what is destined to be important method of examining and treating the larynx, trachea and esophagus.

A most excellent account of the various operations upon the middle ear is given. The subject of disease of the mastoid and its relief by operative measures is very lucidly described. An unnecessary amount of space is given to a description of the operation for the removal of the tympanic membrane, malleus and incus for improving the hearing and tinnitus in chronic catarrh of the middle ear. This operation has fallen almost entirely into disuse to-day, and the reader is apt to attach too much importance to its value from the author's detailed description. Even in chronic suppurative cases the trend of our efforts at the present time seems to be towards preserving instead of removing the contents of the middle ear cavity.

A very comprehensive paragraph is devoted to facial paralysis, complete in all but reference to the operative method of anastomosis of the facial and hypoglossal or spinal accessory nerves in otherwise hopeless cases.

The diseases of the labyrinth are treated by the author with extreme reserve so that only about four pages are devoted to their description. A notable absentee to this important subject is the otosclerosis of Politzer, or the spongification of the capsule of Siebermann.

The author does not advocate the so-called enucleation method of operating on tonsils, for he refrains from describing the instruments used and the method of performing this dissection. He refers only to the "removal of the major portion of the gland, either with the tonsillotome or snare."

The treatment of malignant growths of the larynx

is disposed of as follows: "If the growth is malignant, extirpation of the larynx, either in part or as a whole, gives the only hope of bringing about a cure." No hint is given in this statement of the good results obtained from thyrotomy in the early cases, although this operation is adequately and clearly described.

The excellent work of the publishers, W. B. Saunders & Company, has added much in furnishing the student and physician a volume of good style and convenient size, and it can be frankly recommended to all desiring a succinct and practical book on this specialty. O. J. STEIN.

SYLLABUS OF LECTURES ON HUMAN EMBRYOLOGY: An Introduction to the Study of Obstetrics and Gynecology for Medical Students and Practitioners; with a Glossary of Embryological Terms. By Walter Porter Manton, M.D., Professor of Clinical Gynecology and Professor Adjunct of Obstetrics in the Detroit College of Medicine; Fellow of the Zoölogical Society of London, of the Michigan Academy of Sciences, etc., etc. Third Edition. Revised and enlarged. Illustrated with a colored frontispiece and numerous outline drawings. 12mo, 136 pages; interleaved throughout for adding notes. Philadelphia: F. A. Davis Company. Cloth. Price, $1.25, net.

While this work is specially designed for, and will be found particularly useful to students in their first and second years at college, it is not intended to take the place of the exhaustive text-books on embryology, but is primarily for use in the class-room, supplementary to the lecture and for laboratory guidance. It can also be used for self-instruction and in laboratory work in connection with the usual text-books.

SURGICAL DISEASES OF THE CHEST. By Carl Beck, M.D., with 16 colored and 162 other illustrations. Philadelphia: P. Blakiston's Son & Co. 1907.

The subject of this review is a neatly bound volume of excellent mechanical execution. The type is large and clear, on good paper which brings out very well the numerous illustrations. The work is divided into seven chapters, and is evidently based on a very extensive clinical experience. It is, in fact, evidently intended to represent the personal experience and ideas of the author rather than to be a comprehensive treatise.

The author makes every endeavor to discuss the various subjects that should be embraced under his title, with special reference to their course as modified by their involvement of some part of the chest, but it is evident that practically the entire subject of general surgery must be touched upon. Thus the volume includes such widely diverse topics, as burns, spinal deformities, including deviations and meningocele, tumors, phlegmon, tuberculosis and Hodgkin's disease. A special chapter is devoted to the use of the X-rays.

The author presents with much detail such special subjects as penetrating injuries of the chest wall and empyema, using as a basis a clinical material, the extent of which is evident from the fact that he can speak of 274 cases of empyema under his care in the past fifteen years.

BOOKS RECEIVED

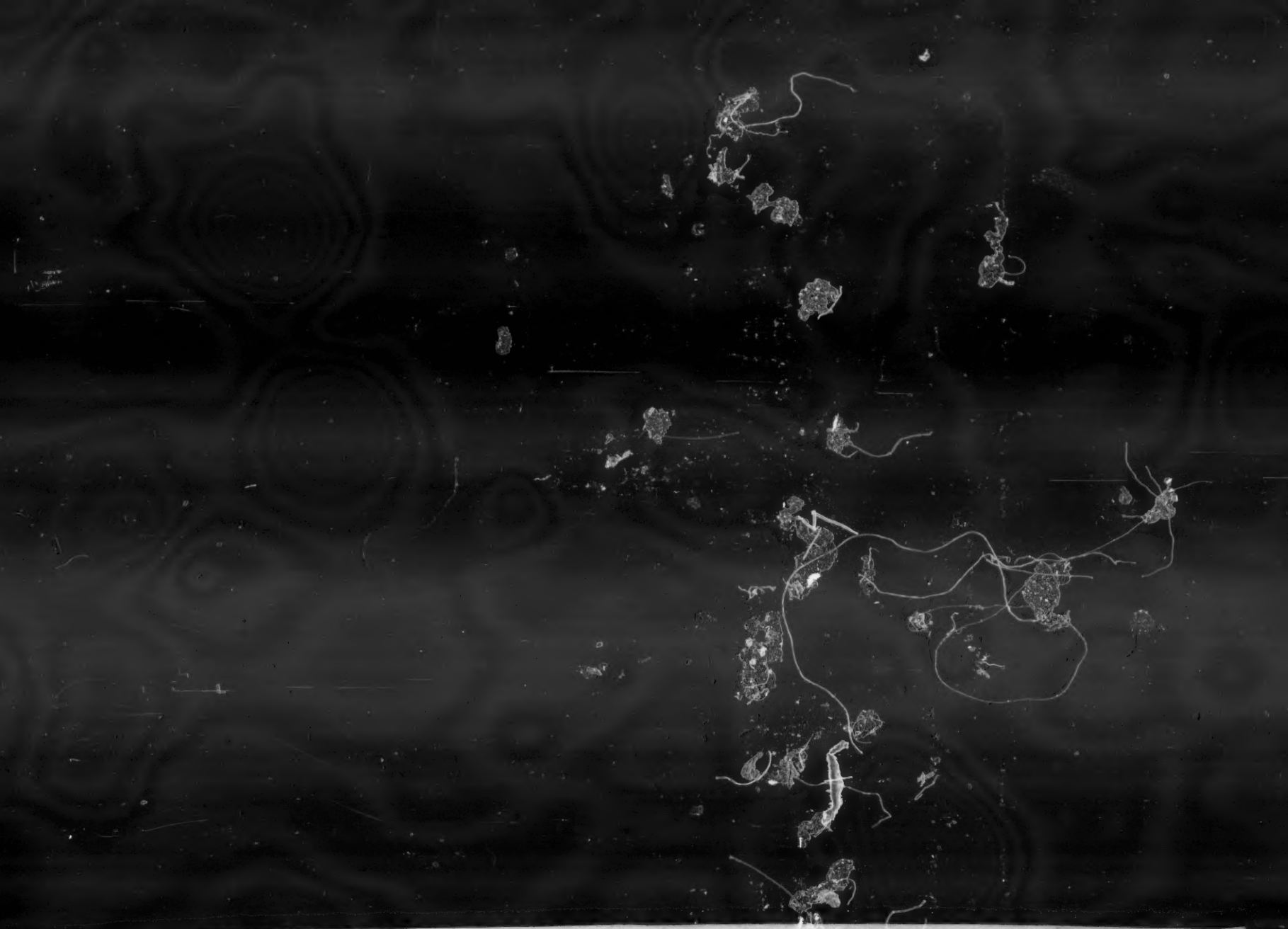
CLINICAL TREATISES ON THE SYMPTOMATOLOGY AND DIAGNOSIS OF DISORDERS OF RESPIRATION AND CIRCULATION. By Prof. Edmund von Neusser, M.D. Part I. DYSPNEA AND CYANOSIS. By Andrew MacFarlane, M.D. New York: E. B. Treat & Co. 1907.

A MANUAL OF ORTHOPEDIC SURGERY. By Augustus Thorndike, M.D., Boston, Mass. With 191 illustrations. Philadelphia: B. Blakiston's Son & Co. 1907. Price, $2.50, net.

KIRKE'S HANDBOOK OF PHYSIOLOGY. Revised and rewritten by Charles Wilson Greene, A.M., Ph. D. Sixth American Revision. With 507 illustrations, including many in colors. New York: William Wood & Co. 1907.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY. By Roswell Park, A. M., M. D., LL. D. (Yale), Professor of the Principles and Practice of Surgery and of Clinical Surgery in the Medical Department of the University of Buffalo, Buffalo, N. Y. With 722 engravings and 60 full-page plates in colors and monochrome. Philadelphia and New York: Lea Brothers & Co., 1907. Cloth, $7.00 net; leather, $8.00 net.

OBSTETRICS. A TEXT-BOOK FOR THE USE OF STUDENTS AND PRACTITIONERS. By J. Whitridge Williams, Professor of Obstetrics, Johns Hopkins University; Obstetrician-in-chief to the Johns Hopkins Hospital; Gynecologist to the Union Protestant Infirmary, Baltimore, Md. Second enlarged and revised edition. With sixteen plates and six hundred and sixty-six illustrations in the text. New York and London: D. Appleton & Co. 1908.



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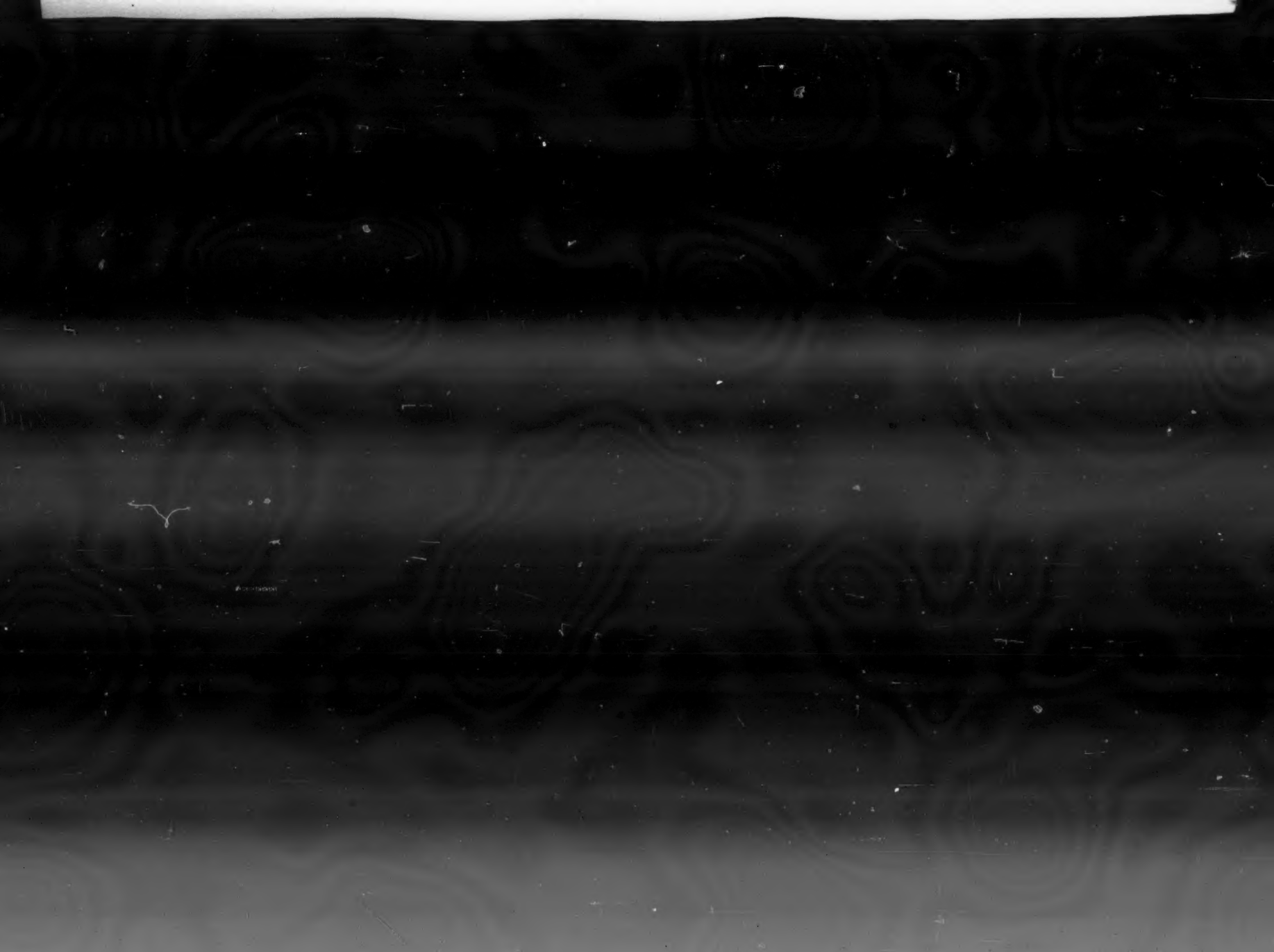

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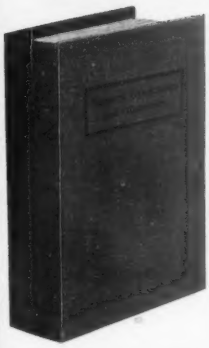

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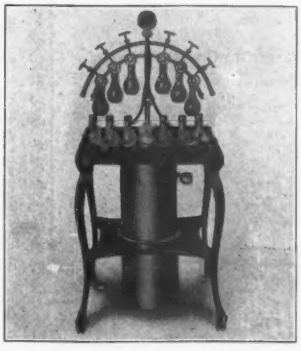

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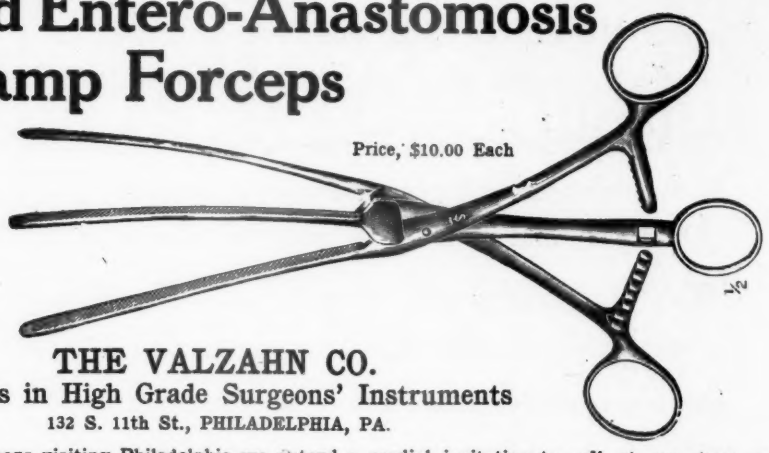

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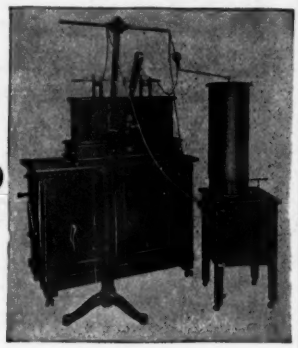

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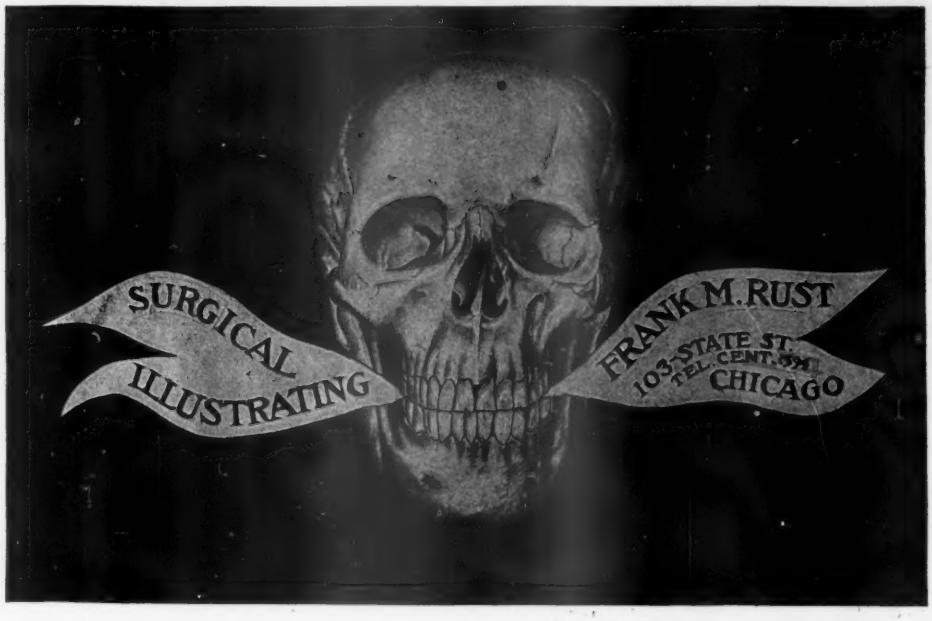

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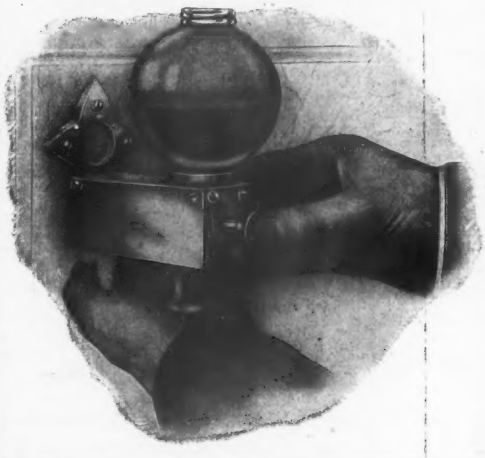

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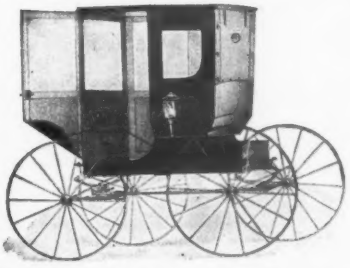

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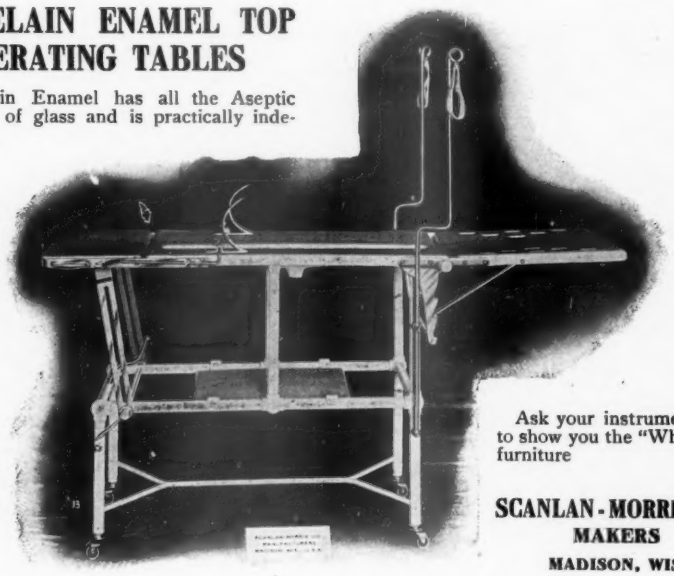

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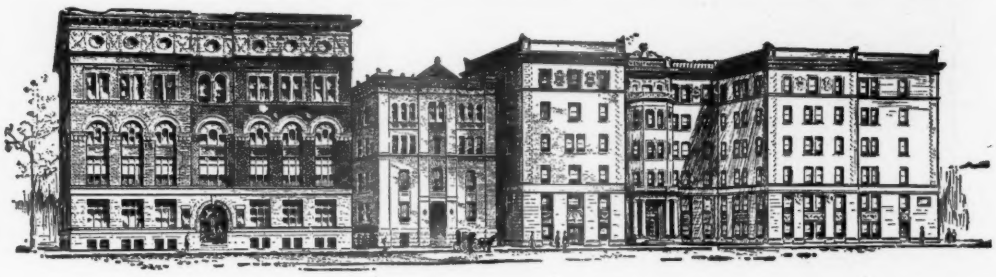

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